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**REPORTS OF THE
DEPARTMENT OF THE INTERIOR**

FOR THE FISCAL YEAR ENDED JUNE 30

1920



VOLUME I

**SECRETARY OF THE INTERIOR
BUREAUS, EXCEPT OFFICE OF INDIAN AFFAIRS
AND RECLAMATION SERVICE
ELEEMOSYNARY INSTITUTIONS**



WASHINGTON : GOVERNMENT PRINTING OFFICE : 1920

Sept. 26, 1931

HARVARD UNIVERSITY
The Division of the Schools

Office of the Director of the Division of the Schools and City Planning

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7609

REPORTS OF THE DEPARTMENT OF THE INTERIOR.

Administrative reports, in 2 volumes.

Vol. I. Secretary of the Interior.
Bureaus, except Office of Indian Affairs
and Reclamation Service.*
Eleemosynary institutions.

Vol. II. Indian Affairs.
Territories.

* The Report of the Reclamation Service is not included in this report as it is made to Congress and printed under its direction.

P 0

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OF THE INTERIOR AND BUREAUS AND OFFICES.**

VOLUME I.

REPORT OF THE SECRETARY OF THE INTERIOR.

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

REPORT OF THE COMMISSIONER OF PENSIONS.

REPORT OF THE COMMISSIONER OF PATENTS.

STATEMENT OF THE COMMISSIONER OF EDUCATION.

REPORT OF THE UNITED STATES GEOLOGICAL SURVEY.

REPORT OF THE DIRECTOR OF THE BUREAU OF MINES.

REPORT OF THE ST. ELIZABETHS HOSPITAL.

REPORT OF THE COLUMBIA INSTITUTION FOR THE DEAF.

REPORT OF THE FREEDMEN'S HOSPITAL.

REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY.

REPORT OF SUPERINTENDENT OF UNITED STATES CAPITOL BUILDING AND GROUNDS.

REPORT OF THE DIRECTOR OF THE NATIONAL PARK SERVICE.

III

ANNUAL REPORT
OF THE
SECRETARY OF THE
INTERIOR

FOR THE FISCAL YEAR ENDED JUNE 30

1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

BUREAUS OF THE INTERIOR DEPARTMENT.

The Department of the Interior was established by the act of March 3, 1849 (9 Stat. L., 395).

GENERAL LAND OFFICE.

Organized as a bureau of the Treasury Department under act of April 25, 1812 (2 Stat. L., 716).

First commissioner, Edward Tiffin, of Ohio; appointed May 7, 1812.

Became a bureau of the Interior Department when that department was organized under the act of March 3, 1849 (9 Stat. L., 395).

INDIAN OFFICE.

Organized as a bureau of the War Department under act of July 9, 1832 (4 Stat. L., 564).

First commissioner, Elbert Herring, of New York; appointed July 10, 1832.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF PENSIONS.

Organized as a bureau of the War Department under act of March 2, 1833 (4 Stat. L., 622).

First commissioner, James L. Edwards, of Virginia; appointed March 3, 1833.

Became a bureau of the Interior Department when that department was organized.

PATENT OFFICE.

Organized as a bureau of the State Department under act of March 4, 1836 (5 Stat. L., 117).

First commissioner, Henry S. Ellsworth, of Connecticut; appointed July 4, 1836.

Became a bureau of the Interior Department when that department was organized.

BUREAU OF EDUCATION.

Organized under act of March 2, 1867 (14 Stat. L., 434).

Became a bureau of the Interior Department July 1, 1869, under act of July 20, 1868 (15 Stat. L., 106).

First commissioner, Henry Barnard, of Connecticut; appointed March 14, 1867.

GEOLOGICAL SURVEY.

Organized as a bureau of the Interior Department under act of March 3, 1879 (20 Stat. L., 394).

First director, Clarence King, of New York; appointed April 14, 1879.

RECLAMATION SERVICE.

Organized under act of June 17, 1902 (32 Stat. L., 388), under the Director of Geological Survey, Charles D. Walcott.

First director, F. H. Newell, of Pennsylvania; appointed March 9, 1907.

BUREAU OF MINES.

Organized as a bureau of the Interior Department under the act of May 16, 1910 (36 Stat. L., 369).

First director, Joseph A. Holmes, of North Carolina; appointed September 3, 1910.

NATIONAL PARK SERVICE.

Organized as a bureau of the Interior Department under the act of August 25, 1916 (39 Stat. L., 535).

First director, Stephen T. Mather, of Illinois; appointed May 16, 1917.

DEPARTMENT OF THE INTERIOR.

Secretary of the Interior.....	John Barton Payne.
First Assistant Secretary.....	Alexander T. Vogelsang.
Assistant Secretary.....	Selden G. Hopkins.
Assistant to the Secretary.....	John Harvey.
Chief clerk of the department.....	E. J. Ayers.
Commissioner of the General Land Office.....	Clay Tallman.
Assistant Commissioner.....	Charles M. Bruce.
Commissioner of Indian Affairs.....	Cato Sells..
Assistant Commissioner.....	Edgar B. Meritt.
Commissioner of Pensions.....	Frank D. Byington.
Deputy Commissioner.....	Frederick A. Royse.
Commissioner of Patents.....	Robert F. Whitehead.
First Assistant Commissioner.....	Melvin H. Coulston.
Assistant Commissioner.....	Lester B. Mann.
Commissioner of Education.....	Phillander P. Claxton.
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Director of the Reclamation Service.....	Arthur P. Davis.
Assistant Director.....	Morris Bien.
Chief engineer, Reclamation Service.....	Frank E. Weymouth.
Chief counsel, Reclamation Service.....	Ottamar Hamele.
Director of the Bureau of Mines.....	Frederick G. Cottrell.
Assistant Director.....	Elmer A. Holbrook.
Director of the National Park Service.....	Stephen T. Mather.
Assistant Director.....	Arno B. Cammerer.
Chairman and chief engineer Alaskan Engineering Commission.....	Col. Frederick Mears, United States Army.
Governor of Alaska.....	Thomas Riggs, jr.
Governor of Hawaii.....	Charles J. McCarthy.
Superintendent of Capitol Building and Grounds.....	Elliott Woods.
Superintendent of St. Elizabeths Hospital.....	Dr. William A. White.
President Howard University.....	Dr. J. Stanley Durkee.
Surgeon in chief Freedmen's Hospital.....	Dr. William A. Warfield.
President Columbia Institution for the Deaf.....	Dr. Percival Hall.

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REPORT OF THE SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR,
Washington, D. C., November 20, 1920.

MY DEAR MR. PRESIDENT:

I beg to report re the administration of this department.

I.

THE PRESERVATION OF OUR NATIONAL PARKS AND MONUMENTS.

This is a vital question.

With the rapid settlement and changing conditions of the West, the wisdom of creating national parks and permanently setting apart as natural museums, pleasure grounds, and game preserves such wonder lands as the Yellowstone Park, the Grand Canyon, the Yosemite, the Sequoia (with its gigantic trees), and other national parks and monuments, and preserving for the present and for future generations these wonderful works of nature, and the wild animals and birds, so plentiful in the early days but now so scarce, is increasingly evident.

The conflict between the demands of commerce and the preservation of these wonder places involves constant vigilance. In my view their preservation is of the first importance. It should be the settled policy of the country, regardless of any question of utility, that when in the wisdom of the Congress national parks or monuments are definitely set apart they must be preserved in their integrity, forever free from any form of commercialization.

If this principle is not recognized, and commercialization in any form is allowed to creep in, it will be only a question of time when our Wild West will be only a memory and the big game of our country will be extinct, and these places and objects, now so wonderful, will be seriously and permanently injured.

It may be well to note, however, that if the argument of utility were permissible, there is usually a ready answer. The water does not remain in the park, and may ordinarily be stored to as good or better advantage outside the park. This is well illustrated in the proposition to dam the Yellowstone River at the outlet of Yellowstone Lake.

The Geological Survey maintains a gauging station on the Yellowstone River near the Canyon Hotel, about 13 miles below the outlet

of the lake. The average daily flow at this station, based on complete records for 23 months, is 3,110 second-feet. There are five small streams emptying into the river in the 13 miles between the proposed dam site at the outlet of the lake and this station; hence the flow at the outlet of the lake is obviously much less than at this station.

A station is also maintained on the Yellowstone River outside of the park, at Corwin Springs, Mont., near the head of Yankee Jim Canyon, some 8 miles below Gardiner. The average daily flow at this point, shown by measurements made during the same period, is 5,870 second-feet.

The volume of water in the river outside the park is, therefore, nearly or quite twice as great as at the outlet of the lake. Indeed, based upon these measurements and the area of land drained, it is the opinion of this department that it is more than twice as great. This increased volume is due to the fact that between the gauging station near Canyon Hotel and Corwin Springs, the Lamar River, Gardiner River, Tower Creek, Trout Creek, Alum Creek, Otter Creek, Sour Creek, Broad Creek, Deep Creek, Hellroaring Creek, Antelope Creek, and other small streams empty into the Yellowstone. A much better site for a dam—due not only to the greater volume of water, but to its location, its deep, narrow rock walls—is Yankee Jim Canyon.

THE FLOOD-CONTROL ARGUMENT.

An argument, quite impressive until analyzed, is that a dam at the outlet of Yellowstone Lake is necessary in order to prevent flood damage from high water in the lower Yellowstone Valley during flood seasons; but, like the argument of utility, this is readily answered:

(a) Yellowstone Lake is a natural reservoir. It is on high ground, 7,741 feet altitude, and the drainage area, compared with other sections of the park, is more restricted and less subject to flood waters; the river from the outlet of the lake to the Upper Falls is placid and little subject to sudden rise. In May, 1920, for instance, when the Lamar and other tributaries were raging, Yellowstone Lake was covered with ice.

(b) The volume of the water in the lake which would be affected by a dam at its outlet is, as previously shown, only half as large as the volume outside the park.

(c) A conclusive argument, however, is found in the fact that a dam built in Yankee Jim Canyon would not only control such overflow as comes from the lake but the larger volume from the Lamar and other tributaries of the Yellowstone.

The flood-control argument, therefore, demonstrates that the dam should be outside the park, and not at the outlet of the lake.

PENDING PROJECTS FOR STORAGE DAMS IN YELLOWSTONE PARK.

A number of projects looking toward using Yellowstone Park for storage of water for reclamation purposes have been proposed:

1. *The Idaho project.*—The first involved the use by Idaho people of Lakes Yellowstone, Shoshone, Lewis, and Heart, the four largest lakes of the park, and the Falls River Basin in the southwest corner of the park, and under a permit granted by the department before I became Secretary some surveys were made of Yellowstone Lake and the Falls River Basin. The proposition is to build a dam at the outlet of Yellowstone Lake for storage to hold the level of the lake at approximately its high-water mark, the water thus stored to be conveyed by tunnel through the Continental Divide to Heart Lake, thence into Snake River, to be used in the neighborhood of Twin Falls, Idaho; and to use Shoshone and Lewis Lakes as reservoirs for the storage, the water also to be used in Idaho; to construct two dams in the Falls River Basin, erroneously claimed to be a swamp, the water to be stored there for use in the vicinity of Idaho Falls and north thereof. Only the Falls River Basin part of this project has been pressed.

2. *The Montana project.*—An association composed of Montana people has been organized to secure the right to build a dam at the outlet of Yellowstone Lake, the water to be used for irrigation in southeastern Montana. At first there was rivalry between Idaho and Montana, but this appears to have been composed. It is urged that it is only desired to build the dam 6 feet high. The most casual inspection of the shores of the lake shows that any material raising of the water would overflow many wonderful hot springs, as well as considerable timber areas; the timber in places comes down to the water's edge.

If the precedent of using the park is established and a 6-foot dam built and the water devoted to reclamation or power uses, increasing demands will speedily arise as other lands come under cultivation or need for more power arises, and the demand for a higher dam and more water will arise and will be well-nigh irresistible. A dam at the place suggested of 25 feet could be built and the question would be "Why not"? The park having been opened up, it would then be only a relative question. Such a dam would submerge 9,000 acres of timber, meadow, lake beach, and small lakes—chiefly in the Pelican and Upper Yellowstone Valleys, only a few feet above the level of Lake Yellowstone. The dam would submerge the small lakes and ruin the hot springs at the thumb of the lake. The Upper Yellowstone Valley, which would be submerged, is our best moose range.

THE FALLS RIVER PROJECT.

This involves a section of the park now practically inaccessible. Claimants urge that its conversion from a marsh to a storage lake by the building of dams would enhance its beauty. Fortunately during the summer it was visited and photographed by exploring parties and found to possess wondrous beauty—containing meadows (fine moose pasture), forests, lakes, trout streams, and a number of beautiful waterfalls, ranging from 130 feet to 380 feet.

The bill authorizing this project (S. 3895) passed the Senate April 6, 1920, apparently without opposition. While in the House the purport of the bill became known, serious opposition appeared, and it did not pass, but is still pending.

DANGER TO THE FALLS.

The water stored in Yellowstone Lake, in the case of the Montana project, if not used until the late summer would lessen the flow over the falls during the early summer months, when the park is filled with visitors. The Idaho project proposed to divert the surplus water from the lake so it would not go over the falls. It is probable that such interference with the normal flow would injure the falls and materially decrease the volume of water in the canyon.

LEWIS AND SHOSHONE LAKES.

Lewis and Shoshone Lakes are both in well-timbered forests, and their shores slope upward very gradually; the rise is almost imperceptible over an area of several miles; vast quantities of timber would be destroyed; and when the water would be drawn out, shallow water or mud flats would greet the visitor.

II.**SUPERPOWER SURVEY.**

Congress at its last session placed upon this department the duty of making a special investigation of the possible economy in fuel, labor, and material that could be secured by electrification of the railroads and industries of the region between Boston and Washington. The plan contemplated is a unified system of power generation and power distribution, and its investigation has been called the superpower survey. This is now under way. The engineering profession and large business interests are giving this project support that is at once an indorsement and a promise of public confidence. The engineering staff engaged in this intensive study of the power needs and the means of meeting that demand includes men who have done pioneer work in applying electricity to the use of man; while

serving on an advisory board are men of vision and experience, representing our larger railroads as well as electric railways, our manufacturing and mining industries, and the engineering and chemical professions, busy men who have accepted my invitation to help direct this investigation along lines of greatest practical usefulness. Every industry that has to do with either making power or using power is giving generous cooperation.

The area being studied, while only a small fraction of the United States—2 per cent—uses 24 per cent of the electric output of the central stations of the country and produces about 47 per cent of its manufactured products. It is properly termed the finishing shop of American industry. The report of this investigation will be completed June 30 next, and its purpose is to give an engineering solution to the problem of the demand of the Nation for greater production and better transportation. That answer is electrification, but its details must include the accurate statement of costs in capital and of savings in coal and labor. I believe the report will deserve public confidence.

III.

ALASKA.

THE RAILROAD.

During July, accompanied by the Secretary of the Navy, I visited Alaska, and inspected the Government railroad from Seward to the end of Steel (mile 245) and there observed the laying of ties and rails. They are now laid to mile 264. When completed, the standard-gauge line will extend from Seward to Nenana on the south bank of the Tanana River, 412 miles from Seward, with a standard-gauge branch of 38 miles leaving the main line at Matanuska Junction (mile 151) to the Chickaloon coal mines, with a spur of 3 miles on this branch to the Eska coal mines.

Fifty-four miles standard gauge are under operation from Healy (mile 358) to Nenana (mile 412), leaving a gap of 94 miles between Gold Creek (mile 264) and Healy. From the north bank of the Tanana River (North Nenana), a narrow-gauge road of 54 miles is in operation to Fairbanks. From Happy station on this line, 7 miles south of Fairbanks, a narrow-gauge branch of 32 miles extends to Chatanika. Total mileage in operation, 445. Total when completed, 540. The clearing on the gap is practically completed, and approximately 40 miles of grading done. The entire road, including the 3,000-foot bridge over the Tanana River at Nenana, should be completed and in operation by the end of the summer of 1922.

COAL MINES.

The Chickaloon mine is being operated for the Navy. A shaft of 600 feet has been sunk and working levels opened. The coal is a fine quality of bituminous, as good as Pocahontas. The vein is irregular, and it is not possible to estimate with accuracy the amount of this coal. Eska is 20 miles west of Chickaloon. There the coal is low grade, bituminous, and is being mined by the Engineering Commission for the railroad, and for domestic needs. Two leases have recently been made here to private parties. All the coal must be washed; a washing plant is in course of construction. Lignite coal in abundance is found south of Nenana, and is being mined for railroad and domestic purposes. Two private companies are operating in this field.

THE PROBLEM OF ALASKAN GOVERNMENT.

Many complaints are made re governmental conditions in Alaska. The problem of government in a country like Alaska is not an easy one. It is not homogeneous; the settlements are widely separated, with no adequate means of communication. It is almost as difficult to get from Juneau to Nome as from Juneau or Nome to Seattle. The winters are long and snows deep, with relatively few roads or trails, and these in the winter are practically impassable. This will continue to a greater or less extent until the country is opened up by railroads.

It is not clear, therefore, how a larger measure of local government would serve a useful purpose. To aid in solving the problem, in April last I appointed a committee consisting of Dr. Alfred H. Brooks, chief geologist of Alaska, who has spent much of his time for more than 20 years in Alaska, as chairman; Mr. Otto Praeger, Second Assistant Postmaster General and in charge of mails for Alaska; E. A. Sherman, Department of Agriculture, in charge of its forests; and H. Y. Saint, of the Shipping Board, familiar with transportation problems to Alaska. Hearings were held and every phase of the subject considered. Attention is invited to the report published herein (Appendix D, page 201), which will be found worthy of careful perusal. It was the judgment of the committee that the wise course was to coordinate the different departments of the Government having to do with Alaska through a committee consisting of a representative from each department. Accordingly such a committee has been named, as follows:

War Department.—Maj. Clarence O. Sherrill, Corps of Engineers.

Navy Department.—Capt. W. C. Cole, United States Navy.

Interior Department.—George A. Parks, mineral examiner and chief of field division, general land office, Alaska.

Post Office Department.—James B. Corridon, superintendent of railway adjustments.

Department of Agriculture.—E. A. Sherman, associate forester.

Department of Commerce.—Dr. Hugh M. Smith, Commissioner of Fisheries.

United States Shipping Board.—H. Y. Saint, staff assistant, office of Director of Operations.

ALASKA'S NEEDS.

At the threshold of Alaskan development is the subject of transportation. Adequate steamship service with reasonable rates for passengers and freight from the Pacific coast to Alaska is imperative; now the service is inadequate. The Alaska Steamship Co., under the same control as the Copper River Railroad and the copper interests in Alaska, and the Pacific Steamship Co., operate a more or less regular service. There is not enough business for both companies. Ordinarily the boats run about 50 per cent capacity, while during the spring and fall, peak-load seasons, persons and freight are compelled at times to wait weeks for space. The Alaska Steamship Co. has a strong position in that its copper ores mined in Alaska furnish return cargoes for its boats.

A simple solution of the problem would be to consolidate the two companies, reduce the expenses by taking off unnecessary boats during ordinary times. This would give a reasonably full cargo at all times. Then secure from the Shipping Board, if need be, additional boats to meet peak-load demands which come uniformly in the early spring and early fall, the Shipping Board to see that a substantial reduction in rates and fares result. The board has ample power to do this. Efforts have been made to accomplish this result, but so far without success, the Alaska Steamship Co. refusing to sell.

Unless some such plan is effected, the necessity for a genuine development of Alaska may make it necessary for the Government to operate its own line of steamships to Alaska, even at a loss, and provide an adequate service at reasonable rates.

If this is done, and a fairly liberal policy adopted, business will revive as soon as conditions in the States become normal.

IV.

FARM LIFE.

The department has given consideration to the problem of domestic reconstruction as related to farming. The census figures show that during the past decade our cities have grown much faster than

farm population; the rate of increase on the farms is only one-fifth of that of the Nation as a whole.

Between 1900 and 1910 the number of farms increased 10.9 per cent, while between 1910 and 1920 only 1.4 per cent.

In Ohio, according to the Department of Agriculture, the number of vacant farm houses increased during the year ending June 30, 1920, from 18,000 to 29,000, or 61 per cent, and the number of men and boys on Ohio farms during the same period decreased 30 per cent. Other States present more or less similar conditions.

Production of foodstuffs was enormously stimulated during the war, resulting in an increase in 1914-1920; but if the decrease above reported continues, what will be the result?

THE FAILURE AND THE REMEDY.

The difficulty is that people do not like to live alone, but prefer to live in towns and villages and to enjoy society and the conveniences and comforts of modern life which are beyond the reach of a scattered population living on large farms.

- Can this be remedied by the ownership of small farms and the formation of neighborhood associations? Small farms bringing people nearer together and intensive cultivation of these farms, may be the answer. Nothing can be better for a country than that people should be attracted to the land and given the opportunity to become independent without being compelled to live in isolation and without the comforts of life.

If the farm unit was 40 acres, better results could be obtained than if the unit is 80 or 160 acres, and living conditions could be made much more attractive.

PENDING LEGISLATION.

Three measures are now pending before Congress which would authorize the Department of the Interior to aid persons desiring to do so to procure farms. All embody the plan of community settlement originally presented in the bill (H. R. 457), urged upon Congress by the President. While primarily designed to provide farms and employment for service men, they could be made to cover a wider field.

The plan is included in the four-option bill (H. R. 14157) advocated by the American Legion, which passed the House in May. Section 6 of the bill is virtually the same measure (H. R. 487) known as the Mondell bill, authorizing the Secretary of the Interior to create community settlements in States where feasible projects can be found, and provides an appropriation of \$500,000,000 for the purpose. This is pending in the Senate.

Bill S. 4372, entitled "World War farm and home-building act," introduced by Senator Borah, has much the same object as the Mondell bill, and appropriates \$300,000,000.

The third measure (S. 3477), now pending, was introduced by Senator Smoot, and is widely known as the "rural homes bill." Primarily designed for community settlements of modest size, this bill is unique in the fact that it does not call for an appropriation. It authorizes the Secretary of the Interior to contract with individuals or corporations for the reclamation, improvement, and settlement of lands in private ownership. Landowners could call upon the Secretary to investigate the feasibility of proposed projects, and later to undertake their development; but the cost of investigation and construction must be deposited with the Treasurer of the United States before the work is undertaken—all moneys to be paid out on vouchers signed by the Secretary. This would furnish protection for the homeseeker in the purchase price and give him the benefit of thorough preliminary studies and investigations made by trained and experienced minds, and he would know that the improvements would be made and the money wisely expended. The department believes that much important work can be promptly undertaken if this measure becomes a law.

The Reclamation Service is available to do the work should the bill pass.

V.

THE INDIANS.

The policy of issuing fee patents to Indians for their lands and thus placing them in a position to sell is, in my judgment, fraught with the gravest danger and will inevitably pauperize thousands. Every Indian family should own a home. This is essential for their ultimate independence. Until the Indians are educated and by long experience become accustomed to the business methods of the whites they will not be in a position to deal with the whites on even terms. The experience of this Department is full of evidence that the Indians are likely to speedily lose their lands by selling them for a wholly inadequate consideration, then improvidently spend the proceeds.

To place all Indians on a plane of business equality with the whites will take generations, and those good people who by legislation or other artificial means seek to unduly hasten this period and thrust the responsibility upon the Indian of dealing with the white man before he is able to do so are doing the Indian a serious injury. This is no reflection upon the capacity of the Indian as such; but it takes time for any race of people, however strong intellectually, to know, understand, and appreciate commercial business methods.

There are exceptions, but not enough on which to rest a legislative program.

The Indian should have citizenship, and his children should, where possible, be educated in the same schools with the whites and be encouraged in every way to become a part and parcel of our national civilization.

OSAGE TRUST PERIOD.

Under the act of June 28, 1906 (34 Stat. L., 539), the land on the Osage Indian Reservation, Okla., aggregating 1,465,000 acres, was allotted to enrolled members of the tribe (except some 20,000 acres for railroads, town sites, etc.), and all minerals under the lands reserved to the tribe for a period of 25 years, after which—unless the trust period was extended by the Congress—the minerals became the property of the individual owner of the land.

Meantime many of the Indians have sold the surface of the land to settlers for \$10 or less per acre; and unless Congress acts the persons who own the surface will in 1931 become the owners in fee of the lands for this inadequate consideration, which, of course, would carry with it the ownership of all minerals, oils, etc. It was clearly the understanding when the lands were sold that the purchasers acquired only surface rights. Similar lands which were sold in fee carrying mineral and oil rights sold for \$100 or more per acre and averaged \$95 per acre. Out of the total of 1,465,000 acres, approximately 500,000 acres have been leased for oil or minerals, leaving about 1,000,000 acres still affected by the trust period. The Indians urge that the trust period be extended by the Congress so they may not be deprived of their mineral rights.

This, in the view of the department, is plainly right; and, as stated to the chairmen of the Committees on Indian Affairs in the Senate and the House March 29, 1920, in letters then written, I again strongly urge the extension of this trust period.

Objection is made by persons who bought the surface rights. Should they succeed in defeating the extension they would be getting something for nothing at the expense of the Indians.

Respectfully yours,

JOHN BARTON PAYNE,
Secretary.

THE PRESIDENT.

ADMINISTRATIVE EFFORT.

THE GENERAL LAND OFFICE.

1. Allowed during the fiscal year original entries of Indian and public lands, 16,434,491.55 acres; an increase of 4,566,310.05 acres over the area entered and allowed during the fiscal year, 1919.

2. Patented during the fiscal year, 11,850,401.337 acres; an increase of 1,073,399.988 acres over the area patented in 1919.

3. Collected from all sources during the year, \$6,131,776.41, and expended during the same period in the public-land service, \$3,364,919.96, leaving a net surplus of \$2,766,856.45 of receipts over expenditures.

4. Collected and turned into the Treasury of the United States as a result of the work of the Field Service, \$131,342.06.

5. Restored to the public domain as a result of investigations in the field, 137,250 acres.

6. Investigated in the field and reported upon 20,865 cases.

7. Conducted 332 hearings in Government contests.

8. Obtained 36 convictions in criminal cases prosecuted during the year.

9. Secured as escrow deposits by oil operators under the act of August 25, 1914, since the passage of the act, and under special agreements, \$9,912,398.40.

10. Instituted four suits to recover possession of oil lands in Louisiana and for an accounting for the oil extracted therefrom, valued at \$317,919.38.

11. Secured a decree quieting title in the United States to 22,514 acres of Arkansas "lake lands," valued at \$1,000,000.

12. Filed two bills in equity involving 5,000 acres of Arkansas "lake lands," of the claimed value of \$400,000.

13. Approved and accepted surveys and resurveys covering an area of 12,478,714 acres, an excess of 4,810,201 acres over the surveys of the year previous.

14. Entered of record 396,324 tract-book notations, as compared with 376,151 notations the year previous.

15. Approved for patent 40,095 final homestead entries.

16. Allowed 36,000 stock-raising homestead entries.

17. Secured the withdrawal, after field investigation, of 2,406,815 acres for stock driveways; the total area now included in such withdrawals being 8,898,258 acres.

18. Realized from the sale of town lots outside of Alaska, \$150,-941.50.

19. Obtained 14 decrees canceling grants of rights of way.

20. Disposed of 106 reports on irrigation companies and districts, in which action taken was favorable in 65 cases, affecting 300 desert entries.

21. Patented 1,765 desert-land entries, as against 1,456 in the year previous.

22. Approved for patent 781 reclamation homestead entries, as against 653 the year previous.

23. Opened to reclamation homestead entry 21,009 acres of irrigated lands.

24. Certified to the States as indemnity school land and for other uses 1,484,761.90 acres.

25. Effected a settlement of the controversy arising between the State of Florida and the United States in the adjustment of school grants to the State.

26. Certified and patented under railroad and wagon-road grants, 527,640.85 acres.

27. Cruised 93,000 acres of timberlands formerly embraced in the Coos Bay Wagon Road grant.

28. Ascertained and paid the taxes due on the lands formerly embraced in the Coos Bay Wagon Road grant, amounting to \$547,-224.10.

29. Sold the timber on 560 acres of land formerly embraced in the Coos Bay Wagon Road grant for \$30,793.30.

30. Sold the timber on 3,464.39 acres of isolated tracts within the former Oregon & California Railroad grant for \$138,519.76.

31. Restored to homestead entry after classification in the field 360,000 acres of land within the former grant to the Oregon & California Railroad Co.

32. Allowed 1,359 Indian allotments of public lands.

33. Issued to Indians under the general allotment act 1,853 trust patents for an area of 181,703.545 acres.

34. Granted 8,185 patents in fee for Indian lands covering an area of 1,138,023.081 acres.

35. Approved for patent 1,002 entries under the Minnesota drainage act, covering an area of 160,320 acres; a total of 927,240 acres having been patented under this act.

36. Sold at public sale 196,083 acres of Indian land for \$634,270.

37. Patented lieu selections for lands in Indian reservations for an area of 20,475.76 acres.

38. Approved for patent mineral entries embracing an area of 52,600 acres, for which \$161,369.50 were received.

39. Awarded two leases for coal lands in Alaska, one in Cook Inlet field and one in the Nenana field; two applications pending, one in the Bering River field and one in the Matanuska field.

40. Received 143 applications for potash prospecting permits on which 61 permits were granted. Total number of permits granted during the year, 162.

41. Patented 30,658 acres under one mineral entry of potash lands in Salt Lake desert, for which the sum of \$76,645 was received.

42. Opened and restored 5,220,565 acres of land subject to the preferred right of entry by ex-service men under public resolution No. 29 of February 14, 1920.

43. Eliminated from National Forests 35,179 acres of school grant lands through cooperative exchange with the grantee States.

44. Conveyed to the States with reservation of mineral deposits 48,291.17 acres.

45. Decided 838 litigated cases, and disposed of on default of 2,624 cases.

THE INDIAN OFFICE.

1. Issued circular information concerning the legal status of the Indians, elicited by ill-considered criticism, and set forth the recent administrative policies with evidence of Indian progress thereunder, including the bureau's attitude in support of legislation to confer citizenship upon all Indians on the basis of their American nativity, but to retain under Government control the estates of incompetents.

2. Reaffirmed the purpose to withhold permission for the use of Indians for exhibition purposes, as inconsistent with their industrial and social advancement and less remunerative than domestic activities on their allotments.

3. Announces a steady increase in attendance of Indian children in State public schools since 1913 and a consequent reduction in the number of Government boarding and day schools, a condition that should result in an extension of Government schools in localities where educational facilities are inadequate.

4. Finds it difficult to maintain normal service in the field because employees secure better pay elsewhere, for which no remedy is yet apparent except some advance in salaries.

5. Reports unusual gains in the number of wage-earning Indians in all lines of industrial and business occupations.

6. Indian interest and expansion in farming and in modern methods is marked. Indian fairs have increased from 12 in 1912 to about 70. Indian borrowers of reimbursable funds are making satisfactory payments.

7. Surplus Indian lands are bringing greatly increased rentals—mainly due to new regulations for leasing to the highest bidder. A revenue of \$8,000,000 was received from this source.

8. Completed systematic surveys have brought reservation ranges up to normal carrying capacity and they now support the largest number of stock consistent with proper conservation of grass. Forty-seven thousand Indians are engaged in stock raising, and the value of their live stock has increased from \$22,238,242 in 1912 to \$37,876,272 in 1919.

9. All epidemics were successfully controlled and the two most obstinate diseases, tuberculosis and trachoma, are now practically eradicated from Indian schools.

10. Made large timber sales on several western reservations at the highest stumpage prices ever received.

11. On the Osage Reservation, Okla., leased for oil 98,866 acres for bonuses aggregating \$12,110,100, besides a royalty of 16½ per cent and upward.

12. Removed restrictions against alienation from 209,945.64 acres of allotted lands of individual Indians in the Five Civilized Tribes, and sold about 62,000 acres of their lands at an average of \$32.03 per acre. Received for restricted individuals of these tribes as oil bonuses, royalties, and rentals \$4,774,566.31; and 242 restricted Indians paid \$351,148.18 as Federal income tax.

13. On November 1 opened a number of reservations to prospecting and lease for mining metalliferous minerals under regulations to make effective provisions of section 26 of the Indian appropriation act of June 30, 1919.

14. The value of irrigation on Indian lands is instanced by the fact that on the Yakima Reservation the gross value of crops on irrigated projects last year was \$10,000,000, which is more than three times the entire cost of irrigation work within the reservation.

15. Crime has greatly decreased on the reservations since the coming of national prohibition.

16. Issued under the "Declaration of policy" of 1917, and on proof of competency of allottees or heirs, and on recommendation of competency commissions, 6,426 fee simple patents, involving 938,418 acres, making approximately twice as many patents issued in the last three years as in the 10 years preceding.

17. Conducted extensive allotment work on a number of reservations and made 737 allotments on the public domain.

18. Made final disposition of 5,368 heirship cases; approved 98 wills and disapproved 60; held hearings by 15 examiners of inheritance on 26 reservations.

19. Formulated a plan whereby the Department of Justice has taken charge of litigation against encroaching settlement by whites and Mexicans on Pueblo Indian lands in New Mexico.

20. Issued instructions to superintendents to aid Indians of the Sioux and other tribes in properly bringing their claims before the

United States Court of Claims, as provided by recent acts of Congress which were urged by this department.

THE BUREAU OF PENSIONS.

1. Paid for pensions, \$213,295,314.65.
2. Returned to the Treasury \$1,820,172.01 of the amount appropriated for the payment of pensions.
3. Returned to the Treasury \$77,637.26 of the sum appropriated for the maintenance and expense of the pension system, including salaries of special examiners.
4. Under the acts of May 1 and June 5, 1920, a section of experts formed in the bureau handled 47,939 cases not requiring declarations in less than five weeks.
5. Upon the passage of the act of May 22, 1920, an act for the retirement of employees of the classified civil service, and for other purposes, a division organized in the bureau promptly set about carrying out the provisions of the act.
6. Receipts for addresses, certified copies, etc. (act Aug. 24, 1912), \$6,860.62. Refundments to pension appropriations, \$10,929.47. Miscellaneous receipts, \$1,345.86.

THE PATENT OFFICE.

Granted—Patents on mechanical inventions.....	37, 316
Granted—Reissue patents.....	227
Granted—Design patents.....	2, 102
Registered—Trade-marks.....	6, 984
Registered—Labels.....	622
Registered—Prints.....	158
Total	47, 400

Sold—Copies of patents.....	2, 522, 218
Shipped to foreign countries—Copies of patents.....	999, 862
Copies of printed office records certified to.....	13, 519
Recorded—Assignments.....	32, 041
Number of words furnished by making photostat copies of office records.....	19, 201, 400
Number of typewritten words furnished as copies of office records.....	29, 865, 100

Number of applications filed for—

Inventions.....	81, 948
Designs.....	4, 110
Reissues.....	322
Trade-marks.....	14, 710
Labels.....	1, 280
Prints.....	570

Total	102, 940
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Number of applications allowed.....	42, 578
Number of amendments filed.....	147, 739
Number of appeals on merit.....	1, 906
Number of petitions to commissioner.....	3, 240
Number of notices of opposition.....	388
Number of interferences declared.....	1, 443

THE BUREAU OF EDUCATION.

1. Conducted an extensive correspondence on educational matters. In all, 166,746 letters were received, eight times as many as in 1910.

2. Printed and distributed 92 publications, 40,000 copies semi-monthly of "School Life," four numbers of "Americanization," and numerous reprints. Aided in distribution of 70,000 copies weekly of "Geographical News Bulletin."

3. Gave information to 40,000 returned soldiers about special courses for them in colleges of agriculture and mechanic arts.

4. Held conferences on highway engineering and highway transport, junior colleges, and Americanization.

5. Conducted five detailed and comprehensive educational surveys and made seven surveys on special phases of one or another school system.

6. Planned a national campaign of education for education and began it by holding the first National Citizens' Conference on Education at Washington, D. C. Held in furtherance of this campaign a special conference at Washington and a State conference at Greensboro, N. C.

7. Held various conferences on commercial education, industrial education, home economics, and the betterment of rural schools.

8. Gave numerous addresses and lectures on education throughout the United States.

9. Enrolled in school-directed home gardening approximately 2,000,000 children, who produced about \$40,000,000 worth of food. Distributed school-garden manuals throughout five climatic regions of the United States.

10. Established 42 centers for the distribution of moving-picture films. Four million nine hundred and twenty-seven thousand feet of film were circulated and exhibited to 8,500,000 persons.

11. Aided community organization in the District of Columbia and presented community center program to the country at large in 104 single lectures and 10 courses of 6 lectures each.

12. Made 10 important studies of conditions in rural schools throughout the United States.

13. Made important studies of and held conferences on village and mining town schools. Began publication of a series of exten-

sion leaflets on kindergarten training and distributed large quantities of material in the promotion of kindergarten education.

14. Published and distributed a series of health education pamphlets and classroom weight records, and by correspondence and lectures promoted child health in schools of the United States. Prepared five special studies for the promotion of child health.

15. Established plan of cooperation in nine States for carrying out the work in connection with the home-reading courses. Sixteen after-war courses were issued and distributed.

16. Prepared a series of lessons for training children in citizenship.

17. Prepared for publication two bulletins on home economics. Held conferences on home economics and on industrial and vocational education.

18. Gave advice in regard to school legislation to State departments of education, State legislatures, school officers, and teachers. Prepared and issued bulletins on school laws.

19. Aided in planning school plants and took direct charge in an advisory capacity of the construction of a number of school buildings.

20. Published and prepared for publication 16 circulars on higher education.

21. Published standardized courses of study for accredited commercial schools. Completed a foreign trade-training survey of 12 cities.

22. Prepared 12 reports on educational conditions in foreign countries.

23. Completed plan of gathering statistics in cooperation with State departments of education. Published seven statistical chapters of the biennial survey for 1917-18 and prepared five chapters for printing.

24. Revised 112 bibliographies and compiled 84. Received 810 calls of consultation at the library and made 2,151 loans of books. Gave libraries information regarding publications and work of the Federal executive departments.

25. Received requests for 5,600 teachers and made 5,000 nominations for positions.

26. Established research stations for the study of special problems in education at 16 universities and colleges; held two conferences for organization and direction of research work.

27. Approved expenditures of colleges of agriculture and mechanic arts and prepared statistical reports on the work of these institutions.

28. Administered the education, medical relief, and support of the natives of Alaska.

THE GEOLOGICAL SURVEY.

1. Carried on cooperative geologic investigations in 29 States.
2. Continued geologic mapping in the United States, covering 52,510 square miles.
3. Performed laboratory work including more than 1,000 chemical analyses.
4. Continued economic studies of manganese, chromite, tungsten, helium, white clays, mica, asbestos, and other mineral deposits.
5. Rendered geologic assistance to the Bureau of Mines, Office of Indian Affairs, and General Land Office, of the Department of the Interior; as well as to Departments of War, Navy, State, Justice, Treasury, and Commerce, and to semiofficial scientific organizations.
6. Revived and completed a number of broad investigations of both economic and scientific value which had been interrupted by the war.
7. Continued geologic and paleontologic investigations of oil shales in Nevada and in the Uinta Basin.
8. Continued work on geologic folios, deferred on account of the war. Completed two folios and performed work on three others.
9. Prosecuted work on two geologic handbooks designed for popular education, one covering the New England States and one including Maryland and Delaware.
10. Continued investigations of deep-well temperatures, which may indicate whether the temperature of oil-bearing areas is greater than that of non oil-bearing areas.
11. Made topographic surveys of areas in Alaska aggregating 2,300 square miles and geologic surveys of areas aggregating 2,700 square miles.
12. Continued general investigations in Alaska, examining especially mineral deposits in the region now being developed by the Government railroad.
13. Continued stream gauging in southeastern Alaska in cooperation with the Forest Service, with special reference to the development of water power for use in the wood-pulp and mining industries.
14. Carried on statistical inquiries and correspondence, in cooperation with the Bureau of the Census, with more than 100,000 mineral producers in the United States.
15. Prosecuted cooperative statistical work in cooperation with the National Coal Association.
16. Continued preparation and issue of weekly statement on coal production and monthly statement on petroleum production; during the coal strike in the fall of 1919 issued daily statement on coal supply.
17. Continued investigations of stream flow by maintaining more than 1,300 gauging stations in 39 States and in Hawaii and Alaska.

18. Carried on investigations of underground water in 14 States and Hawaii and the Dominican Republic.

19. Made special investigations of water resources in connection with classification of public lands with particular reference to the use of water for power or for agriculture under enlarged-homestead, desert-land, and Carey Acts.

20. Continued statistical studies and mapping of transmission lines and electrical power generating plants of public-utility companies. Issued monthly statements on production of electric power and consumption of fuel by public-utility power plants.

21. Classified 24,158 acres of public lands as to their content of coal, 6,449 acres as coal land and 17,709 acres as noncoal land.

22. Recommended withdrawal of 2,797 acres of coal land and restoration to entry of 525,726 acres, the classification and appraisal of which had been completed.

23. Cooperated with the General Land Office and the Indian Office in supplying information concerning the mineral or nonmineral value and the value as to water resources of lands for which applications have been filed, acting on 32,917 requests for information.

24. Recommended the designation of 4,583,577 acres of land as non-irrigable under the enlarged-homestead act and the cancellation of the designation of 421,337 acres that had been previously classed as non-irrigable.

25. Recommended the withdrawal of 62,584 acres for power sites and the restoration of 40,966 acres, increasing the total now so reserved to 2,587,615 acres.

26. Defined and segregated for leasing under the new leasing act of February 25, 1920, nine "known geologic structures of producing oil or gas fields."

27. Recommended the designation of 54,312,588 acres of stock-raising lands, raising the total area so designated to 74,492,336 acres.

28. Recommended designations increasing the area of public-water reserves to 239,283 acres. Recommended designation under the Nevada ground-water reclamation act of 57,600 acres.

29. Mapped topographically 12,392 square miles of territory in the United States.

30. Ran 4,788 linear miles of primary levels and 3,628 miles of primary-traverse lines.

31. Established 1,811 permanent bench marks and triangulation stations.

32. Prepared 6 large-scale special maps for artillery use in the Army.

33. Prepared 16 confidential military reports of surveyed areas for the use of the War Department.

34. Prosecuted surveys in the Virgin Islands and Porto Rico and in the Dominican Republic and Republic of Haiti.

35. Engraved and published 68 topographic maps of areas in the United States and one State map, printing 711,872 copies of new and reprinted maps.

36. Printed more than 4,000,000 copies of various maps, charts, etc.

37. Distributed 898,388 copies of topographic and other maps, increasing the sales by 70 per cent.

38. Published 153 reports containing 17,163 pages.

39. Distributed 639,086 books and folios, embodying geologic reports on water-resources investigations, mineral statistics, etc.

THE RECLAMATION SERVICE.

1. Continued the construction and operation of irrigation works, and actually irrigated in 1919 more than 1,187,000 acres of arid land, covered by project statistics, producing crops valued at nearly \$89,000,000. Including land furnished either in whole or in part with water from the works of the service, under the Warren Act, the value of crops produced in 1919 amounted to nearly \$140,000,000.

2. Increased the area irrigated and covered by crop census 68,000 acres over that of the previous year.

3. Operated irrigation works including 40 reservoirs, a number of power and pumping plants, more than 12,600 miles of canals and drains, as well as pipe lines, flumes, and tunnels, and thousands of structures, such as dams, headgates, weirs, checks, drops, etc.

4. Continued the extension of the projects, including the construction of 349 miles of canals and drains, more than 5,300 canal structures, nearly 300 bridges, and more than 66,000 linear feet of pipe, and excavated nearly 6,000,000 cubic yards of earth and rock.

5. Opened to entry during the fiscal year 290 farm units, all but 23 of which had been filed on at the end of the year. Under the joint resolution of February 14, 1920, soldiers, sailors, and marines were given a preference right of entry for 60 days on land opened subsequent to that date. The terms of the resolution applied to 187 of the farms, and at the end of the fiscal year 173 farms had been filed on by ex-service men.

6. Offered for sale, under the terms of the act of Congress of January 25, 1917, the mesa lands in the first unit of the Yuma Auxiliary project, comprising about 6,400 acres. Of the 532 farms, 518 had been sold at the end of the fiscal year.

7. Began construction of the Riverton project in Wyoming which, on completion will comprise an irrigable area of approximately 100,000 acres.

8. Cooperated with other departments of the Government, with other bureaus of the Interior Department, with State governments,

and with numerous local project organizations in the furtherance of reclamation work and the interests of the water users.

THE BUREAU OF MINES.

1. During the year trained 10,177 miners in first-aid and mine-rescue methods at the mine safety cars and stations, as compared with 9,781 in the fiscal year 1919.

2. Rendered assistance at 27 mine accidents—17 at coal mines and 10 at metal mines.

3. Cooperated with the Army and Navy in work on the recovery of helium from natural gas.

4. Distributed several million pounds of surplus explosives allotted by the War Department to different branches of the Department of the Interior for use in road building and other work.

5. Inspected and analyzed fuels purchased by the United States Government.

6. Conducted tests of electrical mining equipment, including coal-cutting machines, storage-battery locomotives, shot-blasting units, and electric miners' lamps, with regard to safety devices and permissibility for use in gaseous coal mines.

7. Worked on the preparation of leasing regulations for coal lands on the public domain. Investigated the standardization of coals for the export trade. Collected information on methods of coal mining throughout the United States for a monograph showing mining practices employed in the several districts.

8. Investigated coal-mine fires and explosions, with a view to making recommendations for lessening explosion and fire hazards. Continued tests of the explosibility of coal dust from different mines, as well as testing the explosibility of industrial dusts, such as zinc dust and sulphur dust.

9. Continued investigations of ventilation in metal mines of the West, of rock dust in metal mines, and of high temperatures and humidity in relation to their effect on the miner's health. Studied use of underground loading machines in mines throughout the country. Continued an investigation of methods of timbering in metal mines.

10. Prepared for publication a report on the use of liquid oxygen explosives in Germany during the war, and continued experiments with a view to determining the suitability of such explosives for mining work in this country.

11. Conducted for the Army and Navy an investigation of coal, metal, and salt mines, with a view to their suitability for the storage of helium obtained from natural gas.

12. In cooperation with the New York and New Jersey State tunnel commissions, determined the composition of exhaust gases

from motor vehicles and the probable vitiation of tunnel air by such gases.

13. Conducted experiments on the washing of Illinois coals with a view to the improvement of quality and the removal of sulphur. Studied the occurrence and distribution of sulphur in coal. Investigated practice in the coal-washing plants of the State of Washington.

14. Prepared a comprehensive bulletin on recent developments in the brass-furnace industry.

15. Conducted experiments on the recovery of potash from the alunite ores of Utah.

16. Began an investigation of slate quarrying with a view to increasing the efficiency of quarry methods and reducing waste of slate. Collected information on methods of preparing talc and soapstone.

17. Continued an investigation of volatilization methods for extracting lead, gold, and silver from low-grade and complex ores. Investigated methods of leaching the low-grade copper ores of Arizona.

18. Continued a study of the chemical and physical properties of radium and radium products.

19. In cooperation with the State of Colorado, made a general survey of the complex and low-grade ores of that State with a view to determining the extent of such ores and the best methods of treatment.

20. Continued to investigate methods of mining and treating the low-grade iron ores of the Lake Superior district, and began experiments on the smelting of low-grade ores in an experimental blast furnace.

21. Conducted tests of use of coke as a house-heating fuel.

22. Conducted experiments on the concentration and flotation of the ores of molybdenum, vanadium, and quicksilver. Continued a study of the physical and chemical principles underlying the recovery of minerals by the flotation process.

23. Cooperated with the ceramic department of the University of Washington in an investigation of the clays of that State.

24. Investigated practice at water-gas plants in the Middle West with a view to the utilization of local bituminous coals as a generator fuel.

25. Continued cooperative work for the Navy on the preparation of special alloy steels.

26. Conducted an investigation, in cooperation with the State of Utah and the city of Salt Lake, of smoke conditions and the abatement of smoke in Salt Lake City.

27. Prepared plans for an experimental plant at New Salem, N. Dak., where the bureau will study methods of carbonizing lignite.

28. Assisted in preparing operating regulations to protect oil and gas leases on Government lands from waste and damage in drilling and development.

29. Cooperated with the National Committee on the Conservation of Natural Gas in formulating measures intended to conserve supplies of natural gas by more efficient methods of production, transportation, and utilization. Gave demonstrations of ways to prevent waste of gas in the home.

30. Aided in revising specifications for gasoline and lubricating oil to meet changed conditions, thus making available as motor fuel millions of gallons of gasoline that would have gone into other products. Assisted State agencies in preparing regulations for the purchase and sale of petroleum products.

31. Set forth in a bulletin the best methods of studying underground conditions in oil fields, and of developing oil fields most efficiently.

32. Advised and assisted producers in the oil fields of Oklahoma and Texas in overcoming drilling and development problems, with the result that large financial savings have been effected, and the ultimate production of the fields greatly enhanced.

33. Supervised investigations in Wyoming and Colorado oil fields looking to increased efficiency and economy in production methods, effecting at one well alone a saving greater than the cost of the investigative work for the year.

34. Prepared recommendations for correcting conditions causing waste of gas in the Monroe gas field of Louisiana.

35. Studied methods of increasing the ultimate recovery of oil from oil sands. Investigated methods of testing oil, gas, and water-bearing strata in drilling for oil and gas.

36. Studied the underground movement of water, oil, and gas, and their rearrangement in pay sands, with a view to overcoming water troubles in wells.

37. Assisted certain State legislatures in revising regulations for drilling oil wells through coal beds.

38. In cooperation with the Bureau of Internal Revenue continued to study methods for the proper valuation of oil lands.

39. Gave technical advice on the condition of oil lands in the litigated area on the Texas-Oklahoma boundary.

40. Compiled monthly reports on the operation of petroleum refineries, showing the output of the refineries and the consumption of crude.

41. Studied evaporation losses of oil in storage and showed that losses in the Mid-Continent field of more than 122,000,000 gallons a year could be largely eliminated through the adoption of feasible practices.

42. Conducted experiments on the cracking of heavy crude oils and developed a process to the point where it is now ready for commercial test.

43. Showed that gasoline left in residual gases from compression plants can largely be recovered by further treatment of the gas in an auxiliary absorption plant.

44. Conducted a survey of the motor gasolines marketed in the United States and published a report on the subject.

45. Definitely settled that the loss of heating value in natural gas through removal of the gasoline content is negligible.

46. Cooperated with the States of Utah and Colorado in experimental work on the refining of oil shales.

47. Investigated the causes of metal losses in the preparation of aluminum-alloy castings.

48. Continued experiments on the utilization of American graphites in crucibles.

49. Made washing and burning tests of white clays of the East in order to determine their value for ceramic uses.

50. Conducted an investigation of domestic magnesite and dolomite with a view to furthering their use for fire-resistant brick and other products.

51. Investigated methods of chlorinating natural gas for the manufacture of carbon tetrachloride, chloroform, and other products.

52. Determined the causes of the corrosion of Army rifles after cleaning and storage.

53. Investigated the use of gas masks in different industries and developed methods of testing masks for permissibility.

54. Completed a study of the preparation, chemistry, and uses of zirconium.

55. During the year the Government fuel yards handled 266,942 tons of coal, 689 cords of wood, 1,122 bushels of charcoal, and 23 tons of coke. This was distributed to approximately 725 points. Notwithstanding the general shortage of coal, due to miners' strikes in November, 1919, and strikes of railroad employees in April and May, 1920, no consumer was short of coal, this record being possible because of the supply of coal that was in the storage yard. Because of unsettled conditions in the coal trade, it was impossible to make contracts for coal for the coal year beginning April 1, 1920, but through the cooperation of the National Coal Association bituminous coal for April, May, and June requirements was obtained at \$4.25 per net ton, f. o. b. mines, a price much below "spot" quotations.

THE NATIONAL PARK SERVICE.

1. Continued and expanded the work of informing the public about the national parks and monuments under the jurisdiction of this service.

2. Handled the largest volume of tourist travel in the history of the parks; 1920 season, 919,504; 1919 season, 755,325; 1918 season, 451,661; 1917 season, 488,268; 1916 season, 356,097; 1915 season, 334,799; 1914 season, 235,193.

3. Automobile travel to the parks during the 1920 season, 128,074; 1919, 97,721; 1918, 53,966; 1917, 54,692; 1916, 29,358.

4. Handled the largest volume of tourist travel in the history of the national monuments; 1920 season, 138,951; 1919 season, 56,191.

5. Collected \$316,877.96 in revenues from the various operations within the national parks.

6. Maintained high efficiency of entire national-park organization, both in the field and in Washington, under small war-time appropriations and under heavy demands made by unprecedented influx of tourists into the parks and monuments.

7. Prepared 229,840 and distributed 154,909 publications relating to these recreational areas.

8. Prepared and distributed 103,000 automobile maps of the national parks. Continued the circulation of a large quantity of motion-picture film and lantern slides of scenes in the national parks and monuments.

9. Cooperated with highway and other associations in dissemination of information regarding parks and monuments.

10. Fostered the development of museum exhibits in Yellowstone, Rocky Mountain, Sequoia, Mesa Verde, and Yosemite National Parks, and at the Casa Grande National Monument for the delectation and education of the public.

11. Gave particular attention to the conservation of the wild life of the parks and monuments by reduction in number of predatory animals and establishment of game preserves.

12. Continued cooperative work with the Bureau of Service, National Parks and Monuments, of the United States Railroad Administration, established in Chicago, until its termination as Government enterprise, to inform the public regarding railroad rates and tours to the national parks and monuments and other resorts throughout the country.

13. Cooperated with the National Parks Association, the University of California, and other organizations in the dissemination of information leading to a broader use and appreciation of the national parks and monuments.

14. Continuer the course of lectures on the natural attractions of the Yosemite National Park, and established a free nature-guide service therein.

15. Lent many photographs of important national park and monument scenes to exhibitions in this country and abroad.

16. Zion National Park created November 19, 1919, thereby adding Utah's scenic masterpiece to the national-park family.

17. Assumed administration of the Grand Canyon National Park as such, and arranged for complete service to public under national park policies, both on north and south rims.

18. Dedicated the Grand Canyon and the Zion National Parks to their great destiny as public recreation grounds for the Nation.

19. Secured establishment of two new national monuments, Scotts Bluff in Nebraska, and Yucca House in Colorado, under the antiquities act.

20. Secured enlargement of the Gran Quivira National Monument for more effective protection and administration.

21. Established the National Park to Park Highway, the great connected scenic highway between the major parks.

22. Secured cession of complete jurisdiction over Yosemite, Sequoia, and General Grant National Parks from the State of California, and its acceptance by Congress.

23. Began improvement of Zion and Lassen Volcanic National Parks under initial appropriations granted by Congress.

24. Investigated status of lands in Hawaii National Park, and secured enactment of legislation to serve as basis for exchanging private lands within the park for Territorial lands.

25. Secured donation of many valuable tracts of land for the enlargement of the Lafayette National Park, through the personal efforts of the superintendent, George B. Dorr.

26. Secured donation of block of land in city of Hot Springs, Ark., for erection of free public bathhouse.

27. Through private donations secured the elimination of important private holdings in the Sequoia National Park, containing the last of the big tree stands in the Giant Forest in private ownership.

28. Through strenuous efforts and the cooperation of public-spirited citizens and societies saved the elk herds of the Yellowstone from extermination by starvation and the rigors of an exceptionally hard winter.

29. Conducted investigations of large tracts of land containing the redwood, both the sempervirens and the gigantea, in cooperation with the Save the Redwoods League and other organizations, with a view to the further conservation of these rapidly diminishing trees.

30. In cooperation with the States and private parties, continued efforts to save strips of timber along scenic highways leading to and from parks.

31. Cooperated with scientific and educational associations in excavation and research work in the Chaco Canyon National Monument.

32. Secured cancellation of invalid mining claims in the Grand Canyon National Park, thereby making additional important areas available for development for the public.

33. In cooperation with Smithsonian Institution conducted excavation and exploration work of ruins in Mesa Verde National Park.

34. Through civil engineering department prepared surveys and plans for future construction of many important roads and trails needed in development of parks, prepared estimates and specifications for present and future construction and improvement work, and supervised the actual construction and improvement of roads, trails, bridges, and other structures under existing park appropriations.

35. Through landscape engineering department effected harmonious construction of new structures in national parks, and planned development of scenic resources along approved modern lines.

36. Adopted standard system of sign marking for roads and trails in the national parks and monuments.

37. Began repaving of the Hermits Rest-Rim Road at the Grand Canyon National Park.

38. Began installation of complete sewer system on the floor of Yosemite Valley, in Yosemite National Park.

39. Expanded the free public automobile camp sites in the various parks to meet the increased demands of motor travel.

40. Arranged with the various public operators for increased accommodations and conveniences for the public in all the national parks, but principally the Yosemite, Yellowstone, Glacier, Sequoia, and Mount Rainier National Parks.

41. In cooperation with Public Health Service made survey of sanitary conditions in Yosemite, General Grant, Sequoia, and Yellowstone National Parks, with a view to installation of adequate sanitation systems.

42. Planted large consignments of fish fry in the lakes and streams of our larger parks, including the Grand Canyon of the Colorado, in cooperation with State fish commissions and the Federal Bureau of Fisheries, in order to maintain and further develop good fishing for the tourists.

43. In addition to above, kept repair and maintenance work in all the parks up to proper and satisfactory standard, in so far as funds permitted.

ALASKAN ENGINEERING COMMISSION.

During the fiscal year ending June 30, 1920, the following work on the Alaska Railroad was accomplished:

Rehabilitation work on the old Alaska Northern Railway from Seward (mile 0) to mile 70. Snowsheds at mile 54 and mile 75½ completed and other snowshed construction started. Long trestle at mile 47.8, approach to loop district, well under way.

Fifteen miles of rail were laid between mile 227 and mile 242; also, 7 miles between mile 358 and mile 365; a total of 22 miles.

Twenty miles of grading were practically completed between mile 264 and mile 284; also a good portion of the grading for the 20 miles between mile 338 and mile 358.

A good portion of clearing was completed between mile 284 and mile 315, a distance of 31 miles, and a distance of 9 miles between miles 329 and 338. Sections of the line in operation were given necessary maintenance.

Approach to dock at Anchorage completed and dredging being continued to permit of dockage of two boats at the same time.

The following percentages of wagon-road construction were completed during the fiscal year: Miles 264 to 290, 50 per cent; miles 315 to 358, 10 per cent.

This wagon road is being constructed to more expeditiously handle distribution of supplies between ends of steel and to provide a better trail for the carrying of United States mail over the Government railroad from Seward to Fairbanks, a contract having been entered into between the Alaskan Engineering Commission and the Post Office Department for such service.

Line changes were effected which reduced the mileage from Seward to Fairbanks from 471 miles to 467.62 miles.

Approximately 33,000 tons of coal were mined at the two Government mines in the Matanuska field.

Construction work was crippled on the northern division in April and May, 1920, owing to a serious epidemic of "flu" which broke out at Nenana, the northern headquarters of the commission, and the camps south of that point. The chairman of the Alaskan Engineering Commission reported that about 90 per cent of all persons on the northern division were attacked by the disease. Work was gradually resumed about May 15.

A shortage of labor has handicapped the work along the whole line.

Since June 30, 1920, and prior to the time this report went to press, grading has been completed and track laid from mile 242 to mile 262, a distance of 20 miles.

The work which remains to be done includes: Completion of rehabilitation from Seward, mile 0 to mile 70; construction of line from mile 262 to mile 358; erection of bridge over Susitna River at mile 264, steel for which is now on the ground; erection steel bridge at Hurricane Gulch, mile 284; erection steel bridge at mile 373; also bridge over the Tanana River at Nenana.

Since construction work started, in 1915, 343 miles of rail have been laid. This mileage, together with the Alaska Northern Railroad, 70 miles in length, and the Tanana Valley Railroad, 32 miles in length, from Happy Station to Chatanika, both of which roads were purchased by the Government, makes a total of 445 miles of rail under operation.

A map showing progress on the railroad will be found in Appendix E, page 218.

ABSTRACT OF REPORTS OF BUREAUS AND OTHER ADMINISTRATIVE UNITS OF THE DEPARTMENT.

OFFICE OF THE SOLICITOR.

The following table shows the number of matters received and disposed of during the fiscal year ended June 30, 1920, which were docketed or recorded. It does not, however, account for a very large number of miscellaneous matters of which no formal record was kept.

Work of office of solicitor.

	Public lands.		Pensions.		Miscellaneous. ¹	Disbarments.	Summary.
	Appeals.	On re-hearing.	Appeals.	On re-hearing.			
Pending July 1, 1919.....	429	83	105	6	85	4	712
Received June 30, 1920.....	1,821	270	375	30	6,146	15	8,667
Total.....	2,250	353	480	36	6,231	19	9,369
Disposed of.....	1,882	268	398	34	6,164	15	8,750
Pending July 1, 1920.....	368	90	82	2	67	4	613

¹ Under "Miscellaneous" are grouped such matters as "Opinions," "Indian matters," "Contracts," "Losses," etc., as well as many other varied matters arising in the several bureaus of the department, and which, for one reason or another, may be referred to the solicitor's office for consideration.

From the above table it will be noted that out of a total of 9,369 matters referred for the consideration of this office, only 613 were pending at the close of the fiscal year. This is the smallest total of such undetermined matters for many years as disclosed by the various annual reports.

It is also gratifying to note that while the appeals filed in public-land cases totaled 1,821, as compared with 1,360 during the year ended June 30, 1919, yet the number pending has been further reduced, from 429 to 368. All matters are now reached in docket order for adjudication within a reasonable time and are disposed of as promptly as is consistent with careful consideration of the questions presented.

At the close of the fiscal year there were also pending in the courts situate in the District of Columbia 33 cases against the Secretary—12 in the Supreme Court of the United States, 7 in the court of appeals, 14 in the Supreme Court of the District. During the year 11 actions and suits against the department were filed in the local court. In that period 38 cases were disposed of—2 in the United

States Supreme Court, 6 in the court of appeals, 30 in the Supreme Court of the District. In two cases only were the decisions adverse to the department, and these cases have been removed on appeal to the court of appeals. In addition, the favorable judgments of the appellate court in two cases, mentioned in last year's report, have become absolute, appeals not having been perfected. There is also another case in which decision in favor of the Secretary was rendered just before the end of the fiscal year, but in which judgment was not entered until after its close. One case was argued and submitted but no decision rendered. These figures do not include interlocutory matters, several in number. The court of appeals affirmed the judgment of the lower court in the two cases involving the administrative ruling of February 15, 1917 (46 L. D., 32), of which comment was made in last year's report. In all, there has been a net reduction during the year of 11 cases against the department.

GENERAL LAND OFFICE.

Area of land entered and patented.—The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1920, is 16,437,491.55 acres, not including 422,984.44 acres embraced in finals not heretofore counted as original disposition of land. The latter area is constituted as follows: Public auction, 174,499 acres; abandoned military reservations, 6,414.91 acres; cash and private sales, individual claimants and small holding claims, 219,498.19 acres; preemption entries, 10,456.56 acres; soldiers' additional homesteads, 12,115.78 acres. The area of 16,437,491.55 acres is an increase of 4,566,310.05 acres, as compared with the area originally entered and allowed during the fiscal year 1919. Of the total area originally entered and allowed during the fiscal year 8,103,844.81 acres were allowed under the stock-raising homestead act of December 29, 1916.

The area patented during the fiscal year is 11,850,401.337 acres, an increase of 1,073,399.988 acres as compared with the fiscal year 1919. Of the above area 9,239,903.257 acres were patented under the homestead laws, an increase of 927,584.369 acres, not including as homesteads 11,666.546 acres patented as soldiers' additional entries.

Cash receipts and expenditures.—The total cash receipts from the sales of public lands, including fees and commissions (\$1,587,060.79), sales of reclamation town sites (\$124,147.26), sales of lands and timber in the Oregon & California Railroad grant (\$184,168.10), and sales of land and timber in the Coos Bay wagon road grant (\$80,811.30), for the fiscal year 1920 were \$3,974,979.17. The total receipts from the sales of Indian lands were \$2,063,186.06. Other receipts aggregated \$93,611.18. The total receipts of this bureau during the fiscal year 1920 were \$6,131,776.41.

The total expenses of district land offices for salaries and commissions of registers and receivers and incidental expenses during the fiscal year ended June 30, 1920, were \$855,752.18. The aggregate expenditures and estimated liabilities of the public land service, including expenses of district land offices and surveys made from the appropriations for surveying the public lands outside of railroad land-grant limits, were \$3,364,919.96, leaving a net surplus of \$2,766,856.45 of receipts over expenditures. Disbursements from the following special deposit trust funds and reimbursable appropriations are not included in the above figures as receipts or expenditures: From deposits by individuals for surveying the public lands, \$67,771.40; from surveying within land grants (reimbursable), \$16,781.65; from opening Indian reservations (reimbursable), \$6,325.22; from deposits by individuals for resurveys, \$745.47; from deposits for surveys of private lands, \$601.82; and from surveying and allotting Indian reservations (reimbursable), \$84,517.77.

The field service.—As the result of investigations in the field \$131,342.06 was collected and turned into the Treasury; of which amount \$35,519.62 was in settlement of timber-trespass cases, \$13,852.68 from timber sales, and \$81,969.76 recovered through civil and criminal suits instituted by the United States; in addition to which there has been turned into the Treasury \$5,767.11 royalty on coal mined during the past year from a leased tract in Colorado.

As a result of field investigations 137,250 acres have been restored to the public domain. Of this acreage 49,090 acres were restored to the open range by the abatement of unlawful inclosures without suit.

Special agents have investigated and reported on 20,865 cases, 3,794 of which were adversely and 17,071 favorably reported. Three hundred and thirty-two hearings in Government contests have been held. Civil suits in 64 cases were recommended to the Department of Justice as the result of investigation. One hundred and nine were tried in court, of which 82 were won and 27 lost. As the result of the successful prosecution of these suits, \$79,868.76 was recovered and 43,780 acres were restored to the public domain, of which 40,345 acres had been unlawfully inclosed.

Of the criminal cases tried during the year 36 resulted in conviction, under which there were 11 prison sentences imposed and fines amounting to \$2,101 paid.

The commissioner calls attention to the growing necessities of the field work, especially in connection with the operation of the new leasing law, which can not be handled properly without an addition to the present appropriation.

Oil-land claims.—The status of the withdrawn oil lands in California embraced in mineral applications for patent, and the unentered lands involved in suits by the Government, is shown in a care-

fully prepared tabulated statement; and a summary is furnished relative to the status in Wyoming with respect to pending claims and applications for title to oil lands.

Oil contracts.—Nine contracts, covering approximately 840 acres in the Salt Creek oil fields, Wyoming, under the act of August 25, 1914 (38 Stat., 708), were in operation at the end of the fiscal year; the total escrow deposits, or equivalent in surety bonds, under these contracts amounted to \$5,259,459 at the end of the fiscal year.

Outside of these agreements, under special contract, two 80-acre tracts in the Grass Creek oil fields, Wyoming, are operated, under which the total escrow deposits at the end of the fiscal year are \$2,857,802.46.

In California, at the end of the fiscal year, there were 38 contracts outstanding, under which, up to June 30, 1920, the escrow deposits amounted to \$1,795,136.94.

The total escrow deposits under all agreements amount to \$9,912,398.40.

Applications under relief sections of leasing law.—Since the enactment of the leasing law of February 25, 1920 (Public, No. 146), 28 applications for lease or permit under the relief sections 18, 18a, and 19, embracing 10,331.01 acres, have been filed, 20 of these covering lands in Wyoming, 7 in California, and 1 in New Mexico.

"Ferry," or "Caddo Lake," oil lands in Louisiana.—Seventeen of the 18 suits in which the Government obtained favorable decisions in the United States District Court, Western District of Louisiana, mentioned in the last annual report, are now pending on appeal before the United States circuit court of appeals, the remaining suit having been dismissed on the motion of the appellant, which, in effect, gives the Government possession of the oil production and a money verdict for \$1,577.24 and costs.

Four new suits have been instituted to recover possession of 160 acres of land described as the SE. $\frac{1}{4}$ sec. 9, T. 21 N., R. 16 W., Louisiana, and to obtain an accounting for oil extracted therefrom to the alleged value of \$317,919.38.

Arkansas "sunk and lake lands."—The title, which has heretofore been quieted in the Government as the result of litigation that was pending in the Federal courts for several years, is being transferred to private ownership, so that within a comparatively short time the United States will have no further interest in these lands.

March 11, 1920, a decree was entered in the United States district court in favor of the Government quieting title to an area comprising 22,514 acres, conservatively valued at \$1,000,000, locally known as "Big Lake," situated just south of the Missouri boundary line in Mississippi County, Ark. On June 7, 1920, the United States District Court for the Eastern District of Arkansas directed a decree be

entered favorable to the Government, quieting title to approximately 625 acres within the area known as "Bagwell's Lake."

Two bills of complaint have been filed in additional suits, involving lands in the area locally known as "Goldens Lake" and "Youngs Lake," Mississippi County, Ark., embracing in the aggregate something over 5,000 acres, the alleged value of which was placed at \$400,000.

Summarizing the results accomplished under this litigation, the commissioner states that the Government has won 14 suits quieting title in the United States to approximately 60,000 acres of so-called sunk lands and 44,000 acres of so-called lake lands, conservatively valued at \$5,200,000, and recovered the aggregate sum of \$50,000 for the value of timber cut in trespass from these lands.

Surveys.—Attention is called to the fact that this fiscal year marks the tenth anniversary of the inauguration of the direct system of surveys, which has operated to solve many difficulties in securing the accurate and prompt survey of our public lands.

During the fiscal year the returns of surveys and resurveys, amounting to 12,478,715 acres, have been accepted.

A special drive is reported during the past year to overcome the accumulated field and office work in connection with fragmentary surveys, which are now counted as current. The practical completion of the surveys in railroad grants during the present season is expected.

An interesting summary of the reports from the offices of the surveyors general is included in the commissioner's report, from which it appears that the work in these offices is now current, a result somewhat due to the statute allowing the commissioner to detail clerks from one office to another as the special needs of the service require.

Tract-book notations.—The total number of tract-book notations for the present year was 396,324, as compared to 376,151 during the previous year. This includes 52,024 appeals, 1,351 Indian allotments, 41,693 final certificates, and 50,792 original entries. The number of plats posted was 1,398.

Homestead and kindred entries.—During the fiscal year the section that handles this class of work received new cases to the extent of 86,684, which, added to pending cases, made up a total of 99,539 cases, of which final disposition was made of 93,015 cases, leaving at the end of the year pending 6,524 cases.

Stock-raising homesteads.—At the end of the fiscal year 36,000 stock-raising homesteads have been allowed. Eighty-two thousand petitions for designation have been received in the Geological Survey, of which 67,000 have been acted upon and a total area designated of more than 74,000,000 acres.

Stock driveways.—Based on field investigation there have been withdrawn under section 10 of the act of September 29, 1916, during the fiscal year, 2,406,815 acres; the total gross area included in driveway withdrawals at the close of the fiscal year is 8,898,258 acres.

Soldiers' additional homestead rights.—The number of new applications received in the past year was 327, as against 369 the previous year, the office finally disposing of 404 cases by final adjudication or the issuance of patent, as against 347 cases the previous year. The commissioner furnishes a careful analysis of this line of work in his office, and renews his recommendation of the previous year of some legislation limiting the time within which these rights may be presented for adjudication.

Town-site, town-lot, and kindred entries.—Sixteen town-site and kindred entries were sold during the last fiscal year, all of which have been approved for patenting.

There were pending at the beginning of the fiscal year 69 lot entries; there were received 1,673 lot entries; making a total of 1,742, of which 1,648 entries have been approved for patenting, leaving 94 entries pending at the end of the year.

The public sale of lots during the fiscal year, exclusive of Alaska, realized the sum of \$150,941.50.

Among the Alaska town sites, Wrangell was finally closed out under the new regulations by a trustee appointed from the Alaska field division. In the case of Petersburg town site, Alaska, the trustee collected \$9,377.50, disbursed for expenses \$7,690.15, leaving on hand \$1,687.35, which sum was turned over to the city treasury of Petersburg.

Rights of way.—Only about one-half as many applications for railroad rights of way were received during the year as in the year previous. Irrigation development, on the other hand, appears to be growing steadily. Taking the right-of-way work as a whole, excepting hydroelectric, 237 applications were received and awaiting action on July 1, 1919. During the year 502 were received, as against 430 the previous year, of which 497 were disposed of, as against 466 the year before, leaving 247 pending, of which number 134 were awaiting compliance with calls of the office.

Forfeiture cases.—Two hundred and thirteen cases of this kind were docketed, as against 185 the year previous, making a total of 418 docketed cases; of these, 58 were canceled and 79 otherwise disposed of, making a total of 137 finally closed, as against 105 the year previous. Fourteen grants of rights of way were canceled by judicial decree as a result of suits previously recommended by this office. Thirty suits were recommended during the year and have been instituted.

State irrigation districts.—This office has not found it practicable thus far to recommend the approval of any irrigation districts not depending upon the United States Reclamation Service for water supply. During the year applications aggregating 53,072 acres were received, making the entire area now pending action 184,228 acres.

Private irrigation projects.—During the past year 72 new reports and 16 supplemental reports have been received, as against 61 new and 28 supplemental reports in 1919, as the result of investigations of private irrigation enterprises and State irrigation districts upon which claimants and applicants under the desert-land laws were dependent for their water supplies, making a total of 1,066 projects reported since the adoption of the regulations of September 30, 1910 (39 L. D., 253). There were also received from the Director of the Geological Survey 19 reports, made in response to requests of this office for information bearing upon the feasibility of these projects.

Reports on 106 irrigation companies and districts have been disposed of, as against 92 last year. In 65 cases, affecting 300 desert-land claims, the conclusions reached were in favor of the recognition of the project, as against 47 cases, involving 288 entries, in 1919; in 15 cases, affecting about 50 entries and applications, the conclusions were adverse, while 26 cases were closed without any definite conclusion, due to the fact that no pending claims were now involved.

Hydroelectric power.—During the past year 10 permits were granted under the act of February 15, 1909 (31 Stat., 790); easements for transmission lines granted in 4 cases, and payments were made as compensation for the use of the lands under control of the Interior Department, in pursuance of permits and grants for hydroelectric development and power transmission aggregating \$7,443.30.

Carey Act.—Very full summary of transactions under this act is presented in the commissioner's report practically from the date of its passage down to the present, showing that during this period 889,000 acres have been patented thereunder.

Desert lands.—The office during the year received 8,625 applications and entries of all descriptions, as against 7,324 last year; it disposed of 8,650 cases, as against 6,521 last year. It has now pending 7,487 cases, as against 8,907 cases pending June 30, 1919.

Reclamation homesteads.—Original homestead entries in reclamation projects: Nine hundred and forty-four received, 662 allowed, 76 canceled, and additional evidence called for in 455 cases.

Final homestead entries in reclamations projects: Eight hundred and thirty-eight received, as against 732 last year, and 781 approved for patent, as against 653 last year; additional evidence called for in 95 cases.

Stock-watering reservoirs.—Two hundred and twenty-three reservoir declaratory statements were received during the year, which,

together with those on hand July 1, 1919, made a total of 419 cases before the office; of this number, 8 were approved, 84 canceled, 147 otherwise disposed of, leaving pending 180, June 30, 1920.

State selections and State grants.—There were received during the past year 587,763.93 acres of indemnity school-land selections and 27,775.67 acres of selections under grants in quantity, for specific purposes, a total of 615,539.60 acres. During the year 1,317,009.98 acres of indemnity school lands and 167,751.92 acres of quantity-grant lands were conveyed to the States. In addition, 58,435.61 acres of indemnity school land and 4,729 acres of quantity-grant selections were rejected and canceled, the total acreage adjudicated being 1,547,897.80 acres.

There were conveyed to the States, with reservations of mineral deposits, 48,291.17 acres, and 35,179.06 acres under cooperative agreements for the exchange of school-section lands within the boundaries of national forests.

School-land grant to the State of Washington.—The commissioner notes the decision by the Supreme Court of the State of Washington in the case of Thompson against Savidge (188 Pac. Rep., 397), by which the pending controversy between the Government and the State as to the adjustment of the grant to the State is terminated.

Grant of school lands to the State of Florida.—The adjustment of this grant has been made a special study during the past year, in which it is found (1) that the State had received excess indemnity lands to the amount of 7,888.25 acres; (2) that exclusive of such overdrafts, there remained unsatisfied losses to the State school grant amounting to 4,977.85 acres; the State having made good its overdrafts by further assignments of unsatisfied losses the adjudication of the grant will now proceed.

Railroad grants and selections.—Railroad and wagon road selections were received during the year to the amount of 1,710,915.82 acres, as compared with 529,900.03 acres in 1919.

There were certified and patented 527,640.85 acres, as compared with 632,284.40 acres patented in 1919.

New Orleans Pacific Railway lands.—Since the decision in the United States Supreme Court in the case of Josephine Brown et al. against the New Orleans Pacific Railway Co. (248 U. S., 507), 165 applications in conflict with the grant have been filed in which hearings before the local offices have been ordered in 54 cases, with 101 remaining for further consideration.

Settlers on railroad lands in Montana.—Practically all of the claims arising under the act of February 28, 1919 (40 Stat., 1204), have been adjusted and closed. In all, 74 claims were presented, of which 3 were rejected as not within the terms of the act. The company executed relinquishments in 47 cases, embraced in 14 lists, cover-

ing 13,905.38 acres. It refused to relinquish in 24 cases involving 7,040.71 acres.

The Dalles military road adjustment.—At the end of the last fiscal year there had been approved to the company, in further satisfaction of its grant, 16,972.73 acres, within the primary limits, for which acreage patent was issued July 24, 1919.

Coos Bay wagon road lands.—The lands reconveyed to the United States under the act of February 26, 1919 (40 Stat., 1117), aggregating about 93,000 acres, have been examined in the field during the past year for the purpose of determining their character as agricultural or timber lands; while the provisions of this act directing payment of taxes on the reconveyed lands have been carried into effect, a total of \$547,224.10 have been paid to Coos and Douglas Counties, Oreg. The regulations of September 15, 1917, relating to the sale of timber on isolated tracts in the Oregon and California grant were extended to the reconveyed Coos Bay wagon road lands, and one sale has been made thereunder of 560 acres, including 13,650,000 feet, board measure, for which \$30,793.92 were received.

The commissioner notes the conclusion of the suit against the Southern Oregon Co. in consonance with the terms of the act of February 26, 1919, authorizing the dismissal of the proceedings and the reconveyance of the lands involved to the United States.

Oregon & California Railroad lands.—Proceedings to determine the mineral or nonmineral character of approximately 55,000 acres are yet pending, and as to these lands it can not be known to what extent the reversion act will apply. Hence, pending action thereon no payments of taxes claimed on behalf of the counties can be made.

During the year timber on isolated tracts to the extent of 3,464.39 acres was sold, for which the sum of \$138,519.76 was received.

One restoration to entry of lands classified as agricultural was made approximately covering 360,000 acres. Under this restoration 50,837.82 acres had been entered at the close of the fiscal year.

Under the act of May 31, 1918, authorizing the exchange of re-vested timber lands for lands of similar character in private ownership, 17 applications were denied, 11 cases are pending awaiting action, 2 of which have been published under the regulations, and 1 application for exchange has been submitted for approval preliminary to the final consummation of exchange.

Swamp and overflowed lands.—New applications for official identification were received to the extent of 2,871.10 acres and during this period the claim to 29,996.04 acres was rejected and 13,710.38 acres approved for allowance. Patents were issued to Arkansas, 40 acres; California, 11,514.94 acres; Louisiana, 2,101.24 acres; Michigan, 6.57 acres; Mississippi, 47.53 acres.

Private land claims.—A very full review of this line of work is presented by the commissioner with the suggestion of further legislation looking toward the protection of titles having their derivation under foreign grants.

Abandoned military reservations.—The commissioner reports a number of disposals under the act of July 5, 1884 (23 Stat., 103), and the act of August 23, 1894 (29 Stat., 491), notably in Bayside, N. J., Batton Island, Fla., Camp Three Forks Owyhee, Ore. and Idaho, Fort Grant, Ariz., and Gig Harbor, Wash.

Date Creek Reservation, Ariz., embracing 6,370.83 acres originally, was opened to homestead entry March 27, 1920.

Indian allotments.—Applications for the allotment of public lands have been accepted in 1,359 cases during the year, and 459 have been finally rejected. There were issued to Indians under the general allotment act 1,853 trust patents of the total area of 181,703.545 acres. There were also issued to Indian trust patentees or transferees 8,185 patents in fee conveying a total of 1,138,023.081 acres.

Chippewa logging.—One million two hundred and thirty-nine thousand five hundred and sixty feet were cut under contract, for which \$6,114.86 were received; 546,810 feet were cut in trespass, for which \$6,612.87 were collected; the contractors paid \$13,098.66 in interest charges for extensions of time within which to complete their contracts.

Minnesota drainage.—One thousand and two entries were approved for patent during the past year, covering an area of approximately 160,320 acres; a total of about 927,240 acres have been patented under this law as cash purchases.

Public sale of Indian lands.—At Lemmon, S. Dak., 21,798.96 acres were sold for \$60,041.85, at approximately 75 per cent over the appraised value. At Timber Lake, S. Dak., 174,285 acres, appraised at \$428,091, were sold for \$574,229.

Private claims within Indian pueblos.—The commissioner furnishes an outline of the procedure heretofore had under the act of July 22, 1853 (10 Stat., 309), for the identification of Indian pueblos.

Extensions of time to make payments.—Attention is directed to the several acts of Congress and action taken thereunder authorizing the extension of time to make payment on lands theretofore entered.

Lieu selections for lands in Indian reservations.—There were patented during the year 20,475.76 acres, embraced in 15 selections, leaving pending 149 selections, covering 485,675.28 acres.

Mining claims.—The total acreage included in mineral entries approved during the year was 52,600, aggregating a purchase money payment of \$161,369.50. There were 85 contests received during the year, 108 disposed of, leaving 89 pending at the end of the year.

Alaska coal lands.—During the year a part of the Cook Inlet coal field was surveyed and divided into 19 leasing blocks and one lease awarded.

An additional block containing 565 acres, and designated as No. 26, was surveyed in the Nenana field, for which a lease has been awarded.

One application to lease 2,040 acres of land in the Bering River field and an application to lease 1,080 acres in the Matanuska field have been received and are now pending for action.

Potash lands.—One potash lease covering 980 acres of the Searles Lake deposit was issued during the year, making a total of 10 leases outstanding for the Searles Lake land, and one lease of lands in Sweetwater County, Wyo. A total of 143 applications for potash-prospecting permits were received, on which 61 permits were granted.

Total potash permits issued during the year, 162. A patent was granted to the Utah Salduro Co. for an area of 30,658 acres of land in Salt Lake Desert, for which the purchase price was \$76,645.

Mineral leasing law.—The passage of this statute is of too recent occurrence for the production of any statistics that can serve a useful purpose, although it is known that a large number of applications to secure oil-land leases and permits have been filed in the district land offices, and the increase of work incidental thereto has called for a special organization in the General Land Office to handle this work.

National forests.—There are now 152 national forests, embracing 180,299,776 acres, of which a little over 86 per cent is public land. The net increase in national forest area during the year is 6,038,383 acres. There are now in national forests 10 rights of way for wagon roads and 926 administrative sites, embracing 214,958 acres.

Forest lieu selections.—The commissioner furnishes a very full analysis of the several questions that remain undetermined before the department, with a statement as to the number of cases that will be affected in each instance.

Withdrawals and restorations.—During the year past 5,394,799 acres of public lands were withdrawn or placed in a state of reservation under the various acts applicable thereto, and 4,199,647 acres theretofore withdrawn have been restored. These withdrawals and restorations are duly classified in the commissioner's report.

Restorations and openings under public resolution No. 29.—Since the passage of the resolution of February 14, 1920, conferring a preference right of entry upon qualified ex-service men of the recent war for a period of 60 days following the restoration and opening of lands 718,414 acres have been restored and official plats of

lands newly surveyed or resurveyed aggregating 4,502,151 acres have been filed subject to the soldier's preference right.

Contests.—In the year that is now closed the office disposed of 730 litigated cases, exclusive of mineral contests, and 2,624 on default.

Repayment.—Under the several statutes authorizing repayments there were stated during the last year 1,426 accounts, allowing repayment of \$140,292.94, and during said period 419 claims for repayment were denied. This number of claims allowed includes 63 accounts allowing repayment of \$9,404.78 received in connection with sale of various Indian reservations and repaid from Indian trust funds.

Patents.—A statement is submitted showing the number of patents issued and area patented, by fiscal years, from 1911 to 1920. The whole number of patents during this period is 618,430, which conveyed 118,157,582.24 acres.

Certified copies.—The steady annual increase of calls for certified copies of patent records emphasizes the fact that many thousands of these evidences of title have never been recorded in the county records. The entire output of photographic work for the year, including copies of patent records, letter books, papers, plats, tract books, abstracts, etc., approximated 110,000 pages.

Land Service Bulletin.—Attention is directed to the usefulness of this monthly mimeographic publication, established March 1, 1917, in the General Land Office as a medium of direct communication between the different branches of the land service, and the inclusion of an item for printing this publication in our next estimate is recommended.

Important public-land legislation.—A summary of the important public-land laws enacted during the administrative period embracing the years 1913 to 1920, inclusive, is submitted and the fact noted that by such legislation many radical changes have been effected in our public-land policies.

Administrative record.—Significant achievements of the General Land Office during the administrative period covered by the years 1913 to 1920, inclusive, are embraced in a summarized statement.

Compensation of registers and receivers.—A recommendation for legislative action increasing the compensation of district land officers is submitted by the commissioner, together with a full analysis of statutes now governing this matter.

Personnel and salaries.—Under this head the commissioner submits a study of the statutory salaries in the Washington office of the land service, with the conclusion that if the situation is not improved it will result in the inability of the office to properly handle the work it is called upon to perform.

INDIAN AFFAIRS.

Indian progress.—Attention is directed to various evidences of Indian progress under the plan pursued of allotting land in severalty, conducting schools and hospitals for mental and physical betterment, and providing guidance in the productive use of the soil, and the Indian's industrial advancement is mentioned as especially significant. Their individual funds on deposit have increased in the last eight years in excess of \$20,000,000. During that period they have expended for homes, barns, and modern farm implements \$18,000,000 and have added \$13,000,000 to their capital live stock. The Indian's transformation from a game hunter and wanderer to a settled landholder and home builder is everywhere evident. Nearly 37,000 Indian farmers are cultivating over three-quarters of a million acres; 47,000 are engaged in stock raising, and their live stock is worth close to \$38,000,000. Their income for 1919 from the sale of crops and live stock was approximately \$14,000,000. The Indians are dependable wage workers. Their annual earnings in public and private service exceed \$3,000,000. Their number receiving rations and supplies not paid for in labor has decreased one-half in the last seven years.

No backward lure.—Reference is made to the sustained policy of not permitting the Indians to be featured as attractions in various exhibition enterprises of the white man, and in correspondence denying request for a band of Indians for entertainment purposes the following attitude is expressed:

Whatever encourages the Indians to array themselves in warlike costumes of the past, to participate in old-time dances, and the like, must in a measure emphasize the habit and customs of long ago, which if the Indian is to assume the burdens and enjoy the privileges of citizenship should disappear. Moreover, such exhibitions tend to give the public a wrong idea of existing conditions by featuring the Indian as delighting in the atmosphere of the past and in exhibitions of his uncivilized state at the expense and in the discouragement of the progressive, industrious Indian, whose children are in school, whose wife is a good housekeeper, and who is applying himself to the industrial activities which are in harmony with the white man's civilization. So that, everything considered, I must believe that the best interests of the Indians everywhere demand that they be not attracted away from their homes, the care of their stock and crops, and their general domestic duties to the transient return at some distant point of old-time performances which tend to justify the too-frequent charge that they are not progressive and that little benefit has come from the Government's guardianship.

Education.—The work of Indian education is functioned in a chain of schools throughout the Indian country adapted to the particular needs of the race. But it is the policy to encourage the attendance of Indian children in the State public schools as far as possible, thus merging them into the same educational processes as that of the whites. As a result the attendance since 1915 has been diminishing in Government Indian schools and increasing in State schools. Because of this shifting of enrollment it was practicable last year to discontinue 12 Indian boarding schools and a number of Government day schools, which, however, should effect no immediate curtailment of expense, as there are localities, chiefly in the Southwest, where public schools are not, and probably for some time will not, be available and where the school population of the Indians is not sufficiently provided for. There will remain for many years a large Indian population which will require the aid of the Government in those educational facilities which are the very beginning of their fitness for citizenship.

Effort was made during the year to awaken greater interest among school employees in such fundamentals of education as moral training, more thorough and systematic instruction, especially in industrial class work, and an improvement in social morale among school workers in furtherance of better organization and as an exemplary influence among pupils.

Field service and salaries.—The Indian field service is still seriously embarrassed by war and post-war conditions. It has been, and is still, impossible to keep many important positions filled from civil-service eligibles. There is a shrinkage below normal for nurses of nearly 60 per cent; for physicians, 20 per cent; matrons, 12 per cent; forest assistants, 33 per cent; farmers, 30 per cent; and for teachers, disciplinarians, carpenters, cooks, bakers, and engineers, 25 per cent. Employees required for these positions are all very essential to the efficient administering of Indian affairs, and many of them are expected to be capable of giving class instruction in the mechanic and domestic arts, in matters of health, and in agriculture and stock raising. Trained and skillful service can not be procured or retained when it can secure better remuneration in other Government departments and in outside enterprises.

Indian employment.—The value of vocational training in Indian schools is reflected in the increased efficiency of pupils, many of whom are taking their places in the business and industrial life of their community side by side with the whites. The annual colony of student workers was maintained in the beet fields of Colorado and vicinity from June to October, 1919. Thousands of Indians are employed on farms and fruit fields adjacent to reservations. In Box Butte County, Nebr., the work of one community of Indians will

yield 700,000 bushels of potatoes. A steadily increasing number are being employed in motor factories, railway activities, and in clerical positions both in and out of the Indian service.

Farming.—The Indians are rapidly increasing their interest and acreage in agriculture. Last year 36,459 cultivated 762,126 acres of land, producing crops worth \$11,037,589, as compared with 558,503 acres in 1912, producing crops worth \$3,250,288, and their use of modern machinery and methods is now noteworthy. Experimentation and demonstration work is quite generally conducted on farms of the Indians, and the development of the long-staple "Pima" cotton promises wonderful returns in the Southwest, where one Indian realized nearly \$6,000 from 12 acres of this cotton.

Indian fairs have proven a great stimulus to Indian agricultural interests, and have increased from 12 in 1912 to about 70 last year.

Reimbursable funds.—The use of repayment funds has materially aided Indian industrial progress. During the year large credits were applied to previous appropriations of such funds. At the Mescalero Reservation the total indebtedness of individual Indians has been liquidated. At Crow, less than \$600 of \$80,000 loaned from tribal funds remains unpaid. At Flathead, two-thirds of about \$13,000 borrowed was paid back from February 1 to April 30.

Leasing.—The leasing of Indian lands beyond that which the Indians themselves can cultivate is now an established policy which brings good returns in revenue, besides additions to the general food supplies, and develops individual responsibility, as the Indians wherever competent are permitted to manage their own leases and handle the funds so derived.

Approximately 40,000 leases covering 4,500,000 acres of Indian lands were executed during the year, affording rentals to the value of over \$8,000,000. New regulations providing for leases to the highest bidder brought on one reservation an increase of 52 per cent over the old system of renting.

Under regulations in accordance with recent legislation, a fee of \$5 charged for each lease or sublease will defray administrative expense for such work.

Stock raising.—A period of extreme drought in certain parts of the Northwest, followed by a winter of unusual length and severity, resulted in some losses of stock and necessitated a reduction of herds to prevent further loss.

A comprehensive review of the Indians as live-stock producers indicates remarkable gains during recent years in the handling of live-stock ranges and the development of their carrying capacity, together with the financial success of various tribal herds of sheep and cattle, and the active interest now taken by many Indians in the

improvement and better care of their stock and in up-to-date methods of marketing it.

Health.—Such epidemics as have appeared among the Indians during the year have been successfully controlled. Tuberculosis and trachoma constitute the most obstinate disease problems. The systematic régime of treatment and preventative measures has materially reduced these afflictions in the schools, but facilities are inadequate to eradicate them among the adult Indians.

The shortage in nurses and physicians is seriously felt, but the corps of health workers, supplemented by self-sacrificing field matrons and other employees, is accomplishing splendid results, and the general health of the Indians is better to-day than at any time in their history.

Forestry.—The year shows large sales of timber on a number of reservations in Oregon, Montana, Washington, and New Mexico, and prices for stumpage have ranged the highest heretofore received.

The Neopit operations on the Menominee Reservation show the highest annual profit yet attained, and the white and Norway pine lumber, manufactured almost entirely by Indian labor at the Red Lake Reservation, was sold for \$38.50 per thousand feet, mill run No. 5 and better, f. o. b. cars at Redby, Minn.

Decisive action has been taken to increase efficiency of fire control. Forest valuation and land classification are being extended, and complete topographic maps of the Menominee and Quinaielt Reservations were issued.

Oklahoma Indians.—The report includes an article of recent publication containing much historical and administrative information regarding the Indians in Oklahoma, who constitute nearly one-third of their race in the United States and about five-sixths of whom are members of the Five Civilized Tribes. Matters of citizenship, the reform of procedure in probating Indian estates, industrial development—particularly in the mineral products of oil, gas, and zinc—and general agricultural and educational conditions are presented with evident fidelity to the facts as established by official records and in such form as to interest the general reader.

Osage oil and gas leases.—There are on the Osage Reservation in Oklahoma nearly 6,000 oil wells, producing from 2 to 1,800 barrels per day each, with a daily total production of about 50,000 barrels. During the year three oil-lease sales were held, offering at each sale approximately 200 quarter-section tracts. Approximately 98,866 acres were leased at these sales for a bonus consideration of \$12,110,100. Oil leases embracing 540,866 acres are included in lands leased for gas. In addition to bonus, a royalty is paid on oil of 16½ per cent and upward, and the same on gas based on a value of 18 cents per 1,000 cubic feet for gas at the well.

The Osage Indians desire an extension of the mineral trust period for 25 years from 1931, and legislation to that effect is pending which provides for setting aside 3 per cent of the royalty accruing to the Indians for permanent roads and bridges in Osage County. Nearly \$18,000,000 were received by Osage Indians from oil and gas during the fiscal years.

Five Civilized Tribes.—The superintendent's receipts and disbursements for the year were nearly \$48,000,000, the largest of any year in the history of that office. Approximately \$2,000,000 of individual moneys were expended for maintenance, farms, buildings, live stock, and equipment. Restriction against alienation of individual allotted lands was removed from about 210,000 acres, the maximum figure since 1908.

There were 3,590 oil and gas leases disposed of during the year. The annual production of oil and gas was lower, but the income was larger than for the previous year. Nearly \$4,800,000 in bonuses and royalties were received by the restricted Indians.

Federal income tax in excess of \$350,000 was paid by 242 restricted Indians.

The Cherokee and Seminole tribal governments have been abolished.

Oil and gas outside the Five Civilized Tribes and Osage Nation.—The widespread search for oil and gas has resulted in leases for these minerals in practically every State where restricted Indian lands are situated.

On the Kiowa Reservation auction sales of oil and gas leases are held about every two months, and the Indians have thus received the best prices obtainable in cash bonuses for their leases.

On the Otoe Reservation 1,630 acres were leased for oil and gas during the year, making a total of more than 25,000 acres under lease at the close of the fiscal year.

On the Kaw Reservation there has been no production, but prospecting is active, and the revenue of the Kaw Indians exceeded \$50,000 for oil and gas leases last year.

Probate work in eastern Oklahoma.—Harmonious relations now exist between the judges of the county courts and the probate attorneys who look after the protection of the interests of restricted Indians in matters of guardianship, administration of estates, and the rights of minor children in the probate courts of the State.

Indians frequently, without consulting probate attorneys, execute instruments relative to their lands for an inadequate consideration and later, upon finding they were wronged, appeal to these attorneys for help. These appeals are heeded.

Irrigation.—The progressive development of Indian irrigation projects forcibly demonstrates the advantage of artificial applica-

tion of water to arid land. Slightly over \$3,000,000 have already been expended in irrigation work on the Yakima Reservation, Wash., while the gross value of crops raised on the irrigation projects within this reservation during the past year aggregate \$10,000,000. On the Fort Hall Reservation, Idaho, where the area under cultivation is considerably smaller and the climate and soil conditions less favorable, the value of the crops raised during the year exceeded \$1,000,000. This is more than the total cost of the project to date, including operation and maintenance. It is reported that one farmer on the Yakima Reservation averaged \$1,000 per acre for his potato crop, the selling price being \$65 per ton. Later the market price for this product reached as high as \$180 per ton.

The shortage of rainfall in the Northwest affected all irrigation projects last year.

The Blackfoot Reservoir proved sufficient to meet needed demands, and in the face of drought handicaps the Uintah Basin, Utah, produced over \$2,000,000 worth of crops by irrigation.

Purchase and transportation of supplies.—Lack of sufficient funds to carry on all activities on account of the abnormal cost of supplies, including their transportation, necessarily curtailed other projects in favor of the purchase of food, clothing, fuel, and other strict necessities. Field estimates on all classes of supplies were pared to actual needs, and yet, due to market conditions, it required often a second, and sometimes a third, advertisement before purchase could be made. In spite of all these handicaps when the year closed it was found that but little that was needed was left unbought.

The increased cost of material and labor particularly affected the construction of buildings in the service. In many instances the best bid secured after advertisement was so far in excess of the estimated cost and the funds available that the work was necessarily curtailed until some future time.

Suppression of the liquor traffic.—Reports from a number of the Indian reservations show that since the coming of State and national prohibition it is very much more difficult for Indians to obtain intoxicating liquors; that as a result crime has greatly decreased, and the Indians are doing better work and are making more progress in their various industrial activities. Between the passage of the national prohibition law and its going into effect, some of the liquor interests resorted to the trick of spreading information relative to the manufacture of alcoholic liquors, which resulted in a flooding of the country with illicit whisky stills, etc. The Indian country has suffered a share of the resultant violations of the law, and many moonshine stills have been raided and destroyed and the operators prosecuted wherever practicable.

Unsolicited testimonials from State officials show marked progress in the law-abiding qualities of the Indians.

Citizenship for Indian soldiers and sailors.—Recognition of the service of Indian soldiers and sailors who served in the recent war with Germany has been obtained by the passage by Congress of an act providing that Indians who served in the Military or Naval Establishments of the United States, and who have been honorably discharged, may be granted citizenship by courts of competent jurisdiction.

Removal of restrictions and land sales.—Under the "Declaration of Policy" of April 17, 1917, 1,826 patents involving 659,058 acres were issued, and 4,400 patents involving 598,987 acres were issued on proof of competency of allottee or heirs. The total number of patents issued on the recommendations of competency commissions from July 1, 1919, to June 30, 1920, was 722, covering 119,358 acres.

Of the lands of original allottees, usually designated as noncompetent, 1,006 tracts involving 146,047 acres were sold for \$3,566,816, being an average price of \$25 plus per acre.

Of inherited Indian lands there were sold 1,000 tracts involving 155,794 acres for \$4,007,588, an average price of \$25.72 plus per acre.

Throughout the Indian country there has been an unusual demand for lands, and prices have risen accordingly. The advance has affected particularly Indian lands in Nebraska, the Dakotas, and Oklahoma. Where appraisements in 1914 averaged on one reservation approximately \$40 per acre, whole allotments have brought on competitive bids prices running over \$300 per acre.

Allotments.—During the year allotment work continued on the Gila River Reservation embracing about 30,000 acres, and allotments to between 500 and 600 Indians on the Blackfeet Reservation are in progress. On the Umatilla Reservation schedules are prepared for 755 allotments embracing 60,703 acres. On the public domain 737 allotments comprising 106,537 acres were made.

The period of trust was extended by order of the President on allotments made to the Omaha Indians in Nebraska; to the Siletz Indians in Oregon; to the Klamath River Indians on the Hoopa Valley Reservation in California; to the Nez Perce Indians in Idaho; to the Round Valley Indians in California; and to the Indians of various tribes residing on the public domain wherein the period of trust would otherwise expire during the calendar year 1920.

Individual Indian moneys.—Unusually large sums of these funds have been disbursed during the year.

The regulations have been modified so that superintendents have authority to turn over directly all funds to patent-in-fee Indians, to make payment of not to exceed \$100 to reasonably competent adult

Indians without obtaining specific authority from the office, and disburse directly from the lease roll not to exceed \$200 per annum to incompetent adults when their needs require; and to make expenditures from the account of adult Indians in the construction and repair of houses, barns, wells, fences, etc., and the purchase of agricultural implements, live stock, and seed.

Probating estates of deceased Indians and approval of wills.—Five thousand three hundred and sixty-eight heirship cases were finally disposed of; 4,810 of these cases were those on which trust patents had issued; 322 were those on which restricted patents had issued; 121 were personal property cases; 115 were inherited interest cases. One hundred and sixty-two wills were approved and 60 disapproved.

Miscellaneous matters.—A dispute of long standing between the Pueblo Indians of New Mexico and the encroaching whites and Mexican squatters who have located on Indian lands gives promise of adjustment through a plan whereby the Department of Justice has taken charge of litigation suggested to remove the squatters and quiet title in the Indians. In addition, a draft of legislation has been prepared which, if enacted by Congress, will place the affairs of the Indians in New Mexico under more direct governmental supervision and prevent further alienation or leasing of their lands without departmental consent.

The progress of the Florida Seminoles is encouraging, notwithstanding their prejudice against the whites; 12,400 acres of their land have been fenced and are available for grazing. An industrial center has been established, and as soon as funds are available a small herd of cattle will be purchased, to be resold to individual Indians on the reimbursable plan, as they become competent and interested.

Congress, by the act approved June 3, 1920 (public, No. 237, 66th Cong.), authorized the Sioux Tribe of Indians, or any band or bands thereof, to take their claims of whatsoever nature against the United States to the Court of Claims for a hearing and final determination. This act provides also that any other tribe or bands of Indians might, in the judgment of the court, be joined in the suit, which is to be filed within a period of five years after the date of the passage of the act.

The claims of the Great Sioux Nation are of long standing and are based on the provisions of certain treaties and agreements with the Government, which these Indians allege have not been fulfilled.

The passage of the law here cited was urged as a just measure for finally disposing of these old claims before the many witnesses cognizant of the facts pass away.

With respect to roads and highways, the local authorities in the Indian country have been most active in projecting new roads and

in straightening and reducing grades of roads already established across Indian lands, and at least 50 permits for the opening of public highways have been issued therefor.

Good roads are essential to the industrial welfare and progress of the Indians, and every effort has been made during the last year to provide improved facilities of this nature, so far as available funds would permit.

In connection with the usual Fourth of July celebrations there were held on each of the Sioux reservations memorial ceremonies by the Indians in honor of the returned Sioux soldiers and sailors who served in the World War, and in memory of those who lost their lives in such service.

PENSION OFFICE.

Number of pensioners.—There were on the roll at the end of the fiscal year 592,190 names, a net loss of 32,237 from the total of 624,427 on the roll at the beginning of the year.

The number of Civil War soldiers on the roll June 30, 1919, was 271,391, and on June 30, 1920, 243,520, showing a decrease of 27,871. The number of deaths of Civil War soldiers in 1920 was 27,871, as against 27,703 in 1919.

The number of Civil War widows on the roll June 30, 1919, was 293,244, and on June 30, 1920, 290,100, showing a decrease of 3,144.

The deaths of widows, minor children, and dependents in 1920 numbered 21,752, as against 20,069 in 1919.

The highest number of Civil War soldiers on the roll was in 1898, when there were 745,822. The highest number of Civil War widows on the roll was in 1912, when there were 304,373.

Of the War of 1812, there were surviving on June 30, 1920, 71 widows.

Of the War with Mexico, there were on the roll June 30, 1920, 148 survivors and 2,423 widows.

Of the War with Spain, the total number of original claims allowed by the bureau is 41,427. The number on the roll June 30, 1920, by reason of the War with Spain is 30,432.

Unexpended balances of appropriations.—The unexpended balances of appropriations at the end of the fiscal year were as follows:

For Army and Navy pensions.....	\$1, 820, 172. 01
For fees and expenses of examining surgeons.....	15, 129. 30
For salaries	77, 637. 26
For per diem and expenses of special examiners.....	46. 87

Disbursements for pensions.—The amount disbursed in the payment of pensions for the year was \$213,295,314, as against \$222,159,292 for the preceding year. The amount appropriated for the payment

of pensions for the fiscal year 1920 was \$215,000,000, as against \$223,000,000 for the preceding year.

The number of pensioners residing in foreign countries in 1920 was 3,453, and the amount paid to these pensioners was \$1,280,581.

Certificates issued and applications filed.

Pension certificates issued on admitted claims during the fiscal year	22,524
Reissues in lieu of lost pension certificates (duplicates) during the year	1,240
Accrued pension orders issued during the year	14,864
Total	38,637

There were received and classified in the Law Division during the year 57,391 applications of all kinds.

Division of pension.—Under the act of March 3, 1899, providing for division of pension of resident pensioners of the United States who have deserted their wives or children, or who are inmates of soldiers' or sailors' homes, 321 cases were acted upon.

Under the act of August 8, 1882, of all claims of widows and children of pensioners undergoing imprisonment or insane without a guardian, 24 cases were acted upon.

New legislation.—On May 1, 1920, there was approved—

An act to revise and equalize rates of pension to certain soldiers, sailors, and marines of the Civil War and the War with Mexico, to certain widows, including widows of the War of 1812, former widows, dependent parents and children of such soldiers, sailors, and marines, and to certain Army nurses, and granting pensions and increase of pensions in certain cases.

Immediately upon the approval of this act, a circular letter giving full information and clearly and succinctly stating the rates allowed was prepared in the bureau and sent out.

An act to pension soldiers and sailors of the War with Spain, Philippine insurrection, and the China relief expedition, was approved June 5, 1920, and the bureau promptly sent out a circular letter making plain the provisions of this act to those interested.

Under the acts of May 1, and June 5, a section of experts formed in the bureau handled 47,939 cases not requiring declarations, in less than five weeks.

Up to and including June 30, 1920, there were filed in the Bureau of Pensions 13,624 declarations under the act of May 1, and 9,002 declarations under the act of June 5.

An act for the retirement of employees of the classified civil service, and for other purposes, was approved May 22, 1920, and to carry into effect its provisions a division was promptly organized in the bureau. Regulations and rules of procedure were drafted and approved by the Secretary of the Interior, the necessary blanks prepared, and circulars giving information were distributed. On account of the simi-

larity between the operations under this act and those under pension legislation and practice the bureau fears no difficulty in promptly carrying out the purpose of this entirely new legislation.

Witness on pension checks.—The Secretary's order of June 24, 1920, that thereafter no witnesses would be required to sign the indorsement on a pension check except where a pensioner signs by mark, made unnecessary over 4,000,000 signatures annually and relieved pensioners and those who cashed their checks of much trouble and annoyance.

Commendation for Special Examination Division.—

DEPARTMENT OF THE INTERIOR,
Washington, April 24, 1920.

DEAR MR. SALTZGABER: The auditor reports, after having made a very careful audit and complete examination of my disbursement of the appropriation "Investigation of pension cases, Pension Office," fiscal year ended June 30, 1919, for the above period, no errors were found in any payment, and consequently no suspensions or disallowances were made against me. This speaks well both for the accuracy and efficiency of your Special Examination Division and its well-arranged method of administrative examination of all vouchers of the field force, prior to certification of their correctness and approval by you and payment by me. I am making this statement to you as evidence of my satisfaction and approval of the work in this direction, so well performed by your Special Examination Division. The division deserves the heartiest commendation in its efforts to protect the disbursing officer from any possible loss in the payment of an inaccurate account.

Cordially yours,

GEO. W. EVANS,
Chief Disbursing Clerk.

Operations of special examination division for five years.

	1916	1917	1918	1919	1920
Appropriation.....	\$85,000.00	\$80,000.00	\$80,000.00	\$90,000.00	\$100,000.00
Expended.....	84,721.50	79,503.44	79,728.66	89,982.51	99,953.13
Unexpended balance.....	278.50	496.56	271.34	17.49	46.87
Average number of examiners.....	49	51	49	46	49
Depositions taken.....	26,457	26,595	29,505	34,314	35,254
Depositions per examiner.....	538	543	605	738	719
Reports submitted.....	5,417	5,590	5,813	6,133	6,385
Reports per examiner.....	110	115	119	132	130
Cases disposed of.....	2,608	2,829	3,174	3,802	3,891
Cost per case.....	\$32.49	\$28.10	\$25.12	\$23.67	\$25.69

PATENT OFFICE.

The business of the office the last year was the heaviest in its history, exceeding substantially the record of any previous period, and straining the facilities of the bureau to the utmost. The receipts of applications for patents for inventions amounted to 81,948, an increase of 19,193 over the previous year, or 30 per cent; for applications for registration of trade-marks, 14,710, an increase of 6,149, or

72 per cent; and for total applications, 102,940, making an increase of 27,283, or 36 per cent. The total number of patents granted and trade-marks, prints, and labels registered was 47,409. This was 4,056 more than in the preceding year and 6,068 less than in 1916. The receipts of money for the year were \$2,615,697.33, being an increase of \$502,347.16 over the preceding year, or 23.8 per cent, while the net deficit for the fiscal year 1919 of \$65,228.13 was turned into a net surplus of \$179,135.96, making a relative net increase for the year of \$244,364.09.

BUREAU OF EDUCATION.

During the year the bureau continued to carry out the policy of acting as a clearing house for educational information and the best opinions on educational matters, of giving advice, of promoting desirable educational ideas, and of conducting experiments.

Correspondence.—The Washington office received 166,746 letters, 45,828 library publications, and 58,287 forms of various kinds. This does not include the field service.

Publications.—In spite of the increased cost of printing the bureau published 62 bulletins, 1 annual report, 1 annual statement, 18 leaflets, 10 circulars, 24 numbers of 40,000 copies each of *School Life*, 4 numbers of *Americanization*, and numerous reprints and miscellaneous documents. It aided in issuing 70,000 copies weekly of the *Geographic News Bulletin*. A directory of all the school officials in the United States was published.

Statistics.—The plan of cooperation in gathering statistics with State departments of education was carried to completion. Seven statistical chapters of the biennial survey for 1917–18 were printed, five were prepared and sent to press, and two are in the process of completion.

Library.—One thousand two hundred and twenty-four volumes were added to the library by gift, exchange, and purchase; 390 volumes were transferred from the Library of Congress; serial numbers accessioned were 3,520; periodical numbers, 8,358; received from the bindery, 656 volumes. One hundred and twelve bibliographies were revised and 84 new ones were compiled.

Libraries throughout the United States were assisted by giving a general knowledge of the printed matter issued by the United States Government and how it might be secured.

Aid to returned soldiers.—Information was given to a very large number of returned soldiers who wished to go to college of the different courses offered in the various colleges and schools of the United States, and the scholarships and fellowships that might be secured, and in general of the higher educational institutions of the United States.

Special activities.—In higher education a number of bulletins were prepared and published, or are now ready for the press. These bulletins deal with such subjects as "Plans for the training of teachers," "University extension work," "Junior colleges," "Opportunities for graduate study," and statistical information about universities and State colleges.

In rural education studies have been made of plans of consolidation, certification of teachers, worth-while schools, high-school dormitories, standardization of rural schools, comparative salaries of school teachers, and of the teacher shortage throughout the United States.

In the field of city school systems much attention was given to problems of administration and supervision in village schools, especially those of small mining towns. A number of circulars and pamphlets were published to further the spread of kindergarten education, to arouse public interest in it, and to provide plans for State kindergarten associations.

Home economics bulletins relating to the organization of home economics courses in secondary schools and to rural school lunches were prepared. Information was gathered concerning the institutions offering home economics work, State laws affecting home economics teaching, and the status of this branch of education in elementary and secondary schools.

The cause of public health through the care of school children was promoted by a series of five special studies dealing with janitor service, school health supervision, one-story school buildings, age-weight-height standards, and physical education in colleges and universities.

A standardized course of study for commercial schools was prepared and sent to all private business schools on the mailing list of the bureau.

Surveys of 250 cities for the purpose of determining their needs in men to carry on foreign trade were continued during the year. A report on educational preparation for foreign service was completed.

The bureau made studies of the educational systems of foreign countries. Among these were Scandinavia, Finland, Holland, Switzerland, Great Britain, Austria-Hungary, Japan, Latin America, France, and Germany.

The School Board Service Division reestablished its files of teachers' names, and in the period from December 1, 1919, to July 1, 1920, received calls for 5,600 teachers and made approximately 5,000 nominations.

A clearing house for expert opinion.—In the matter of gathering expert opinion on special subjects of immediate importance the bureau held two conferences on highway engineering and highway transport and appointed a committee to develop an organization that would collect fundamental source material for use in preparing suitable textbooks in highway engineering and highway transport. A conference was held for the purpose of discussing and formulating policies for the junior colleges.

Conferences were held at Minneapolis, Minn., and Cleveland, Ohio, to discuss methods by which Americanization work could be carried on successfully, and to review the results obtained in the cities where it had been going on for some time.

A conference was held at Cleveland to consider the welfare of the schools in the 12,000 villages of less than 2,500 population in the United States. A conference of similar nature was held at Pittsburgh in November to aid in solving the problems of education in the small mining towns of the Appalachian Mountain regions.

Advisory.—As an advisory body the bureau continued its activities this year by making school surveys, giving help in school legislation and in school-plant construction, and aiding in other educational work in which its assistance was asked. Five detailed and comprehensive surveys were made. These were of the Hawaiian Islands, interesting and valuable because of the problems involved in educating widely differing racial groups; of Memphis, Tenn., a rapidly growing industrial city; of Winchester, Mass., a well-to-do city suburban to a big city; of the city of Brunswick and Glynn County, Ga.; and of a typical cotton-mill village at Erlanger, N. C. Seven special surveys were made. These dealt with school building and financial needs of Lexington, Ky.; the business methods of the board of education of Augusta; adult education on Passaic, N. J.; the building needs of Meriden, Conn., and Gloucester, Mass.; the principle of consolidation, as applied to the Mount Joy Township in Adams County, Pennsylvania; and the educational needs of the Locust Point community in the city of Baltimore.

Advice in regard to school legislation.—State laws relating to textbooks, public-school revenues, and continuation-schools were studied and bulletins prepared. The biennial summary and digest of school legislation were completed and submitted for publication. State legislatures were assisted in determining what the legal status of any particular phase of education is and in enacting laws in the light of the best practice and experience.

School-plant construction.—Bulletins on schoolhouses were supplied. Architects from all parts of the country were helped to make plans and corrections in school plants, and direct charge was taken in an advisory capacity of constructing a number of school plants.

Promotion.—For the purpose of promoting desirable tendencies in education, the bureau in May, 1920, held the first National Citizens' Conference on Education at Washington. This meeting was followed by a special conference for the purpose of laying plans for conducting a national campaign for education. As the first step in carrying out this campaign, a State conference was held at Greensboro, N. C.

Other conferences.—Nine of a series of 12 regional conferences were held to promote commercial education. Two conferences were held on industrial education and two for the promotion of home economics. Twelve of the series of rural conferences planned for the promotion of rural education throughout the United States were held in 10 different States.

Citizenship training.—The bureau caused to be published a series of lessons in civic training, with the end in view that the civic instruction of the child take its point of departure from his experience and refer back to it.

School-directed home gardening.—The working force of the United States School Garden Army was reduced because of decreased appropriation. The mailing list of schools actively engaged in gardening was brought to a total of 45,000. All single-sheet mimeographed lessons were revised and printed in manual form for the five climatic regions of the United States. It is estimated that more than 2,000,000 children did school garden work, and produced more than \$40,000,000 worth of food.

Visual instruction.—At the close of the war the bureau gathered large quantities of film prepared for war purposes and from other sources, that might be distributed to the schools during the year. It established distributing centers for these films in nearly every State and put in circulation approximately 4,927,000 feet of film, which was exhibited to 8,500,000 persons.

Home education.—Aid has been given to education in the home by means of 22 reading courses, 17 of which have been issued in leaflet form and distributed. Sixteen of these were after-war courses, and 150,000 copies of them were sent into camps and cantonments. Fifteen thousand persons reading for formal recognition have been enrolled in the various courses in the several States.

Community organization.—The bureau assisted in community-center development work in the 17 sections already organized in the District of Columbia and in cooperation with the Post Office Department in Mount Joy Township, Adams County, Pennsylvania. The community-center program was presented to the country at large in 104 single lectures delivered at various meetings. Special courses of six lectures on community work were given in 10 colleges.

Child health.—The health of children was promoted by encouraging the record of height and weight as an index to nutrition and general health. A series of seven pamphlets were prepared and printed. Approximately 500,000 pieces of material were sent on request. The work was carried on through the agency of the Red Cross workers, home demonstration agents, public health nurses, and other organizations.

Research work.—For the purpose of conducting experiments in education a plan has been arranged to establish research stations at those universities and colleges maintained by public funds that are willing to cooperate with the bureau in making research studies with the bureau's aid and direction. Sixteen such stations have been established, and they are now carrying on investigations in a large number of subjects very pertinent to the present-day educational activities.

Land-grant colleges.—The bureau prepared an annual report regarding the financial administration of the land-grant colleges, certified to the Secretary of the Interior that the money granted to these colleges by the Federal Government had been spent according to law, and made the necessary certification to Congress authorizing the continuance of the annual appropriation according to the Morrill-Nelson Acts.

Alaska.—The bureau administered the education, support, and medical relief of the natives of Alaska along thousands of miles of coast line and of great rivers, although problems of transportation made the work unusually difficult for the year. Schools and community work were carried on in 67 villages. Two hundred and fifty children left orphans by the epidemic of influenza were cared for in Eskimo families and in orphanages. The colony at Metlakatla progressed so satisfactorily that it is hoped it may take over in 1921 the cannery of the Annette Island Packing Co.

If there has been the normal increase, there are now 180,000 reindeer in Alaska. The Bureau of Biological Survey of the Department of Agriculture, in cooperation with the Bureau of Education, will make investigations, experiments, and demonstrations for the improvement of the reindeer industry.

At the request of the Secretary of the Interior, the Navy Department transferred to the bureau the U. S. S. *Boxer*, to be used in transporting employees and supplies to and from Alaska.

Under the direction of the superintendent of education, the entire work of taking the Alaska census of 1920 was done by the employees of the Alaska service.

Recommendations.—The Commissioner of Education has submitted a series of 29 recommendations for the betterment of the bureau, so that it may effectively deal with the very complex prob-

lems of an educational system to meet the needs of over 20,000,000 children residing in a territory so vast that conditions vary in all gradations, from those common to the extreme tropical zone to those prevailing in the extreme frigid zones. He desires to restore several activities of the bureau for which Congress did not appropriate the necessary funds during the last year. They are in connection with school-directed home gardening in cities and towns of over 2,500 inhabitants, one of the best and most valuable forms of employment for children between the ages of 8 and 15 years; the instruction of persons of foreign birth in the English language, and in the geography, history, industrial requirements, and manners and customs of our country, a work vitally important to the strength and welfare of the Nation; community organization, for the purpose of gathering the activities and interests of communities around the schoolhouse as a center; educational extension, to extend education for vocational efficiency, for citizenship, and general culture to many of the 4,000,000 recently discharged soldiers, to millions of laboring men and women and to the recently enfranchised women of the United States, to the millions of foreign-born men and women who wish to become acquainted with the ideals of America, and to the 2,500,000 boys and girls who every year attain their majority and enter the rank of active citizens; education of racial groups, for the purpose of solving the problem of the adaptation of the means of education to the Negroes of the United States and the education of the backward peoples in its Territories and possessions; and school-board service, through which the bureau can greatly help boards of education and boards of trustees of universities, colleges, normal schools, and technical schools in finding teachers of the grade and kind that are sought from the country at large rather than from local communities. All of these activities have at one time been carried on by the bureau and the need for them has been amply shown.

In addition to the reestablishment of those things already mentioned, the commissioner recommends that the bureau receive appropriations for and take up the investigation of the education of the exceptional children, such as the deaf, the blind, the incorrigible, the diseased, and those whose superiority, general or specific, makes it desirable that they be given special opportunities in special subjects or for general promotion; the investigation of adult illiteracy and the dissemination of information as to the best methods of teaching illiterate men and women to read and write; cooperation with schools, universities, colleges, and normal schools in making important and definite experiments under scientific control in elementary and secondary school education; and cooperation with State and county officers in establishing and maintaining model rural schools

for the purpose of adding to the effectiveness of rural schools throughout the United States.

For the established work of the bureau in the fields of higher education, rural schools, commercial education, child health, city school administration, visual instruction, cooperation between school and home, industrial training, foreign educational systems, statistics, and medical relief in Alaska, the commissioner desires increased appropriations, additional members to the staff of expert workers and clerical force, larger traveling and printing funds, higher statutory salaries, and the removal of the limitation placed upon salaries paid from lump-sum appropriations.

He renews his recommendation for the erection of a building adequate to house the educational activities of the National Government, and suggests that such a building might properly be erected in memorial of the patriotic services rendered by the schools, their teachers, and pupils during the Great War, and that these teachers and children might well be permitted to contribute to the cost of the building.

GEOLOGICAL SURVEY.

Nature of the work of the year.—Only the briefest review of the varied activities of the Geological Survey's scientific service is necessary to show that every one of its activities is forward looking—that facts are being collected with which to guide present action and to plan for future action. This is true not only of a special investigation like the superpower survey just authorized, but of the collection of stream-gauging records, the making of topographic maps, the study and the estimation of mineral resources and mineral production, and even the interpretation of geologic history. The Geological Survey's function in the classification of the public lands is not simply cooperation with the General Land Office in the administration of the land laws—it is a cooperative effort to insure the best use of these lands, to plan their use so that the West may not have to pay the penalties attaching to an unwise disposition of the Nation's real estate.

Though for 40 years the Geological Survey's policy has been to contribute to the formation of a national plan, its own outstanding need to-day is a plan for itself, a program. The recognized function of a scientific bureau is to collect and arrange facts upon which the Nation may base its plans for future development, but the Geological Survey now finds itself unable to plan adequately its own development. It lacks that assurance of continued appropriations that would encourage or warrant long-term investigations, a few of which are absolutely essential in any forward-looking program of scientific research.

Owing to the conditions now existing the Geological Survey is not fully occupying the field which is recognized as peculiarly its own. It could, however, with slightly increased appropriations; and especially with a declaration of intent by Congress to regard the scientific bureau as having successfully passed its probationary period, greater stability might be expected and some progress might be made in the adoption of a program fitted to the country's needs.

The examination of storage sites made in 1888-1891 was pioneer work that marked a beginning in the larger utilization of the water resources of the West, and it is unfortunate that this special investigation was discontinued, for now authoritative information of this kind would be invaluable in planning the storage of flood waters for power and irrigation in the West and for power development, improvement of navigation, and flood protection in the East. The Nation can well afford to invest in engineering and geologic data for future use.

In general, the results of the varied activities of the Geological Survey may be regarded as meeting with a constantly increasing measure of public approval, as shown by the larger use that is being made of this branch of the public service. Correspondence with all classes of citizens—ranchers and corporation officials, school children and university professors, prospectors and mining engineers—has continued to increase, and this gain has been evident in the requests both for specific information and for publications. Ten years ago a telegraphic request for a map or report was a notable incident; now telegrams of this kind are of daily occurrence.

The appropriations for the public work under the Geological Survey for the fiscal year 1919-20 comprised items amounting to \$1,586,353.50. The number of employees holding permanent appointments from the Secretary at the end of the fiscal year was 966.

Geologic surveys.—With the conclusion of studies of war minerals and other studies undertaken for military use the Geological Survey resumed its normal work. During the year the geologists were engaged in mineralogic, petrographic, glacial, mining-geologic, structural, sedimentary, coal and oil field, and physiographic investigations. The work done included also economic studies of deposits containing manganese, chromite, tungsten, helium, white clays, mica, asbestos, magnesite, mercury, and peat. Much of this work was done in cooperation with State organizations, and the results of some of it have been embodied in published reports. A number of broader investigations, of both economic and constructive scientific value, begun before the war, were revived or completed and their results were published.

Special cooperation was carried on between the Geological Survey and the Bureau of Mines, the Office of Indian Affairs, and the

General Land Office, in the Interior Department, and with the War Department, Navy Department, State Department, and the Department of Justice; with the Public Health Service, the Supervising Architect, and the Bureau of Internal Revenue, in the Treasury Department; with the Bureau of Standards, the Bureau of Fisheries, and the Bureau of Foreign and Domestic Commerce, in the Department of Commerce; with the United States National Museum; and with outside institutions, including the Geological Survey of Canada. Investigations and surveys were undertaken at the request of the governments of the Virgin Islands and Porto Rico, the Dominican Republic, and the Republic of Haiti. Cooperative geologic investigations were carried on with 29 States.

The depletion of the geologic staff by reason of resignations due to the inadequate salaries paid greatly reduced the scientific output. Many losses resulted from the impossibility of obtaining suitably trained geologists to take charge of projects, already started, that are of large public value. Urgently needed geologic investigations in some regions had to be indefinitely postponed, and requests for cooperative investigations from several States could not be granted.

The geologic mapping included 52,510 square miles, and the laboratory work included over 1,000 chemical analyses.

Surveys in Alaska.—The year's work included geologic surveys of 2,700 square miles, topographic surveys of 2,300 square miles, and a continuation of stream-gauging work in southeastern Alaska in cooperation with the Forest Service, with special reference to the possible use of water power. This work should be of benefit not only to mining but to the wood-pulp and other industries. Owing to the decrease of the appropriation for work in Alaska during the war from \$100,000 to \$75,000 and to the large increase in costs the field work done since 1918 has amounted to only about 50 per cent of that done in preceding years. Investigations in Alaska are therefore much in arrears, at a time when the large expenditures for Government railroad construction demand that every effort should be made to encourage the mining industry through surveys and investigations that will increase the knowledge of the distribution and occurrence of the mineral resources of the Territory. In the work done special emphasis has been placed on the surveys of regions tributary to the Government railroad, but it may also be pointed out that all advances in mining in any part of the Territory will directly or indirectly benefit and be benefited by the railroad.

Statistics of mineral production.—In the Geological Survey's statistical force, as in the rest of its personnel, resignations and furloughs depleted the number of specialists and clerks. At the beginning of the fiscal year the force engaged in this work included 44 specialists; at the end of the year there remained only 25. Yet

during the year the demand for work and for information, especially information relating to coal and oil, constantly increased. Weekly reports on coal were continued only by the active cooperation of the National Coal Association. During the strike of the bituminous miners in the fall of 1919, a daily bulletin on the coal supply was issued for the use of Government officials. The Geological Survey also prepared many special reports on particular phases of consumption and distribution for the use of the Central Coal Committee in its task of apportioning the limited amount of coal available. The agitation for an embargo on exports also necessitated the furnishing of a large amount of information, and in this work the Bituminous Coal Commission afforded financial assistance.

The stress in the petroleum industry brought constantly increasing demands for information. The work done included the preparation not only of monthly and annual oil reports but of replies to daily requests for information received from all parts of the country. The statistics of natural gas and natural-gas gasoline likewise demanded increased attention.

Other demands required the compilation of general statistical geologic and geographic information on the mineral reserves of the world, a study begun during the war. The survey was called upon by other Government organizations, scientific societies, and many large companies and individual citizens to furnish information on foreign mineral resources. Many mineral commodities are of decided practical interest to a large part of the American people, because of our dependence upon or competition with foreign products. Foreign oil has recently been the subject of most interest, and on this subject the survey has compiled and analyzed a large amount of information. Work was pushed on the World Atlas of Commercial Geology, which includes maps and text dealing with the mineral reserves of Europe, Latin America, and other foreign countries.

Cooperation with the Bureau of the Census during the year, as in previous census years, greatly retarded the survey's work on mineral resources. At the present rate of progress the work of compiling the data showing the production in 1919 will extend into 1921 and will overlap the Geological Survey's own canvass for 1920, thus retarding the reports for both years. Although this cooperative work is intended to avoid duplication of effort both by the Government and by the producers of mineral commodities, the methods of work in the two bureaus and the objects sought are so different that cooperation greatly increases the labor of the Geological Survey without improving the quality of its work.

Topographic surveys.—During the year 25 topographic engineers who had received commissions in the Army were reinstated in their former positions. Nine engineers were on furlough for cooperative

work in Haiti and Santo Domingo. Besides this outside cooperation internal cooperation was maintained in 21 States and 1 Territory, with a total cash contribution from the cooperating officials of \$190,500. Cooperative mapping was also carried on with the National Park Service, the Bureau of Public Roads, and the Illinois State Department of Public Works and Buildings. The new area topographically mapped in the United States was 11,178 square miles, making the total area surveyed to July 1, 1920, 1,301,136 square miles, or 42.9 per cent of the entire country. In addition, 1,214 square miles were resurveyed, so that the total area surveyed during the year was 12,392 square miles.

The year has added to the Geological Survey's topographic publications a distinctly new class prepared for the War Department, represented by 6 large-scale special maps for artillery use in the Army. Sixty-one reports on areas surveyed, containing confidential military information, were transmitted to the War Department.

Water resources.—Investigations of surface streams were continued by maintaining gauging stations in 39 States and in Hawaii and Alaska. Only through cooperation with States and other Federal organizations has it been possible to carry on the large amount of work in progress. Thirty-one cooperating States and Hawaii have contributed \$173,380 for work, and the Indian Office, National Park Service, Forest Service, and Reclamation Service have also contributed largely to the study of the flow of particular streams. Gauging stations have thus been maintained at 1,349 points.

Underground water investigations were in progress in 14 States, in Hawaii, and in the Dominican Republic. The work on underground water in Hawaii is of importance because of the great value of ground water in these islands for municipal, irrigation, and military supplies. The work was made possible by funds supplied by the Territorial government and the city of Honolulu.

Many investigations of the present and probable future use of both surface and ground waters were made in connection with the classification of public lands, with special reference to their use for power under permit or for agriculture under the enlarged-homestead, desert-land, or Carey Acts. The results of such investigations are, in general, specially reported to the Commissioner of the General Land Office and to the Secretary of the Interior.

Statistical studies begun during the war in cooperation with the United States Fuel Administration and mapping of the transmission lines and electric-power generating plants of public-utility companies have been continued.

Field work was pushed in the examination of lands applied for under the enlarged and stock-raising homestead laws. By resigna-

tion from the service and by death the field force available for this work was reduced from 32 classifiers to 21.

Land classification.—During the year 24,158 acres were classified as to their coal content, 6,449 acres as coal land and 17,709 acres as noncoal land; also 525,726 acres of coal lands were restored to entry during the year and 2,797 acres withdrawn.

No oil, potash, or phosphate lands were withdrawn during the year, but 954 acres were classified as nonoil land and restored to unrestricted entry, and 89 acres were eliminated from a potash reserve in California.

Nine "known geologic structures of producing oil or gas fields" were defined toward the end of the year, and thus segregated for leasing under the new leasing act of February 25, 1920. An additional area of 62,854 acres of lands valuable for power was withdrawn, and 40,966 acres, found to be without material value for power purposes, were released from withdrawal. The result is an increase of area of power-site reserves from 2,565,727 acres to 2,587,615 acres.

The area of former Oregon-California Railroad grant lands designated as power-site lands was increased to 141,653 acres, an addition of 380 acres. At the end of the year 764,438 acres of land in Arizona and 196,400 acres in New Mexico were included in areas designated as valuable for water power under the enabling acts of those States, a reduction of 4,600 acres in the area for New Mexico. The area in outstanding reservoir withdrawals was increased to 83,693 acres as the result of the withdrawal of 1,714 acres in Wyoming as sites needed for control of water supply.

The operations under the stock-raising homestead law were an especially noteworthy feature of the classification work of the year. A net increase of 54,310,468 acres in lands designated as stock-raising lands, raising the total area so designated from 20,181,868 acres to 74,492,336 acres, was the result of a strenuous effort to keep pace with the demands for entry of lands for homesteads to be devoted primarily to stock raising.

An additional area of 4,583,577 acres was designated as nonirrigable under the enlarged-homestead acts, and 421,337 acres found to have been improperly classified were excluded from designations previously made. The total area remaining so designated at the end of the year is 292,959,481 acres.

The area in public water reserves was increased to 239,283 acres.

An area of 57,600 acres was designated under the Nevada ground-water reclamation act toward the end of the year.

Publications.—The Geological Survey's engraving and lithographic plant executed a large amount of after-the-war work for different branches of the Government service, as well as much mis-

cellaneous work for many Government bureaus and for the Government Printing Office.

New topographic maps of areas in the United States to the number of 68 were engraved and printed. Editions of 183 different maps, amounting to 711,872 copies, were published. Contract and miscellaneous work involved the printing of 3,524,689 copies, and the total editions of all work printed amounted to 4,243,769 copies, an increase of nearly 10 per cent over the number in the preceding year. The survey's publications of the regular series printed at the Government Printing Office included 153 new reports, aggregating 17,163 pages. During the year the survey distributed 621,132 books, 17,954 folios, and 898,388 maps. The sales of maps increased 70 per cent over those of the previous year.

RECLAMATION SERVICE.

The progress of reclamation.—June 17, 1902, the date of the approval of the reclamation act, marks the beginning of reclamation by irrigation on the part of the Federal Government. During the 18 years which have elapsed since that time, 24 so-called primary projects and 4 Indian projects have been constructed in whole or in part, and scores of secondary projects have been examined to determine their feasibility with a view to their possible development later as funds become available. On June 30, 1920, the net cost of construction of the reclamation projects amounted to a little less than \$125,000,000. The value of crops grown in 1919 on lands served either in whole or in part from the works of the service amounted to nearly \$153,000,000, about \$89,000,000 of which represents the value of crops grown on the 1,113,469 acres of cropped land on the projects proper, from which definite crop statistics are secured, or \$79.88 per acre, and the balance an estimated amount from approximately 1,000,000 acres of land served with water under the Warren Act from the works of the service. The projects already completed or under way will ultimately comprise an area of over 3,300,000 acres.

Investigations of new projects.—The interest in opportunities on the land has been increased with the return of our soldiers, sailors, and marines. This doubtless has had its effect in the willingness of States and other organizations to cooperate with the service in investigating the feasibility of new projects. In fact, owing to the very limited funds available for this work, it is practically a policy of the service to make these investigations contingent upon payment of at least half the cost by other interested individuals or organizations. This has resulted in securing a large amount of valuable information concerning the feasibility of numerous projects, work on many of which should be commenced within the near future. The definite desire on the part of thousands of landless men and women to

become part of a movement "forward to the farm" should be met by a comprehensive scheme of reclamation development.

Projects and extensions of projects investigated by the Reclamation Service in the Western States.

State and project.	Irrigable acreage.			Mean altitude.	Mean rainfall.	Probable cost. ¹	Readiness for construction.
	Public.	Private.	State.				
Arizona:				<i>Ft.</i>	<i>Inches.</i>		
San Carlos.....	* 40,000	30,000	.....	1,500	10	\$13,600,000	Not ready.
California:							
Imperial Valley.....	400,000	.....	.....	-200	3½	52,000,000	Ready
Palo Verde.....	.....	40,000	.....	250	3	5,000,000	Not ready.
Turlock-Modesto.....	.....	200,000	.....	95	12	5,000,000	Do.
King's River.....	.....	400,000	.....	225	10	12,000,000	Do.
Orland extension.....	.....	30,000	.....	245	18	2,500,000	Ready.
Iron Canyon.....	.....	250,000	.....	230	17	35,000,000	Not ready.
Cuyamaca Water Co.....	.....	* 2,750	.....	400	12	(²)	Do.
Volcan Land & Water Co.....	.....	* 24,600	.....	500	15	(³)	Do.
Jess Valley.....	.....	* 17,800	.....	4,400	12½	1,100,000	Do.
Colorado:							
Grand Valley.....	15,000	15,000	.....	4,825	8	600,000	Ready.
Grand Valley drainage.....	.....	30,000	.....	4,650	8	1,200,000	Do.
Orchard Mesa.....	.....	9,700	.....	4,750	8	800,000	Do.
Uncompahgre.....	10,000	37,000	.....	5,500	9½	500,000	Do.
Montezuma.....	.....	42,000	8,000	5,000	12	3,500,000	Not ready.
San Luis Valley drainage.....	.....	400,000	.....	7,600	7	10,000,000	Ready.
Idaho:							
Hillcrest.....	3,000	10,000	1,000	2,800	13	700,000	Do.
Black Canyon.....	3,000	35,000	1,000	2,400	12	2,000,000	Do.
Mindoka.....	95,500	250	6,750	4,300	12½	15,000,000	Not ready.
Gem District.....	.....	27,000	.....	2,350	12	750,000	Ready.
Lake Walcott.....	2,480	.....	20	4,400	12½	215,000	Do.
American Falls Reservoir.....	* 33,000	33,000	.....	4,300	.....	12,000,000	Not ready.
Island Park Reservoir.....	* 10,700	5,000	.....	6,250	15	4,000,000	Ready.
Boise Valley drainage.....	.....	30,000	.....	2,500	12½	600,000	Do.
Pavette Valley drainage.....	.....	10,000	.....	2,250	11½	180,000	Do.
Shelley Canal.....	* 100,000	.....	.....	4,600	14	(⁴)	Not ready.
Bruneau.....	* 400,000	.....	.....	4,200	11	(⁵)	Do.
Mountain Home.....	* 400,000	.....	.....	4,000	13	(⁶)	Do.
North Side Twin Falls.....	* 50,000	.....	.....	4,000	12	(⁷)	Do.
North Side pumping.....	* 115,000	.....	.....	4,000	12	(⁸)	Do.
Hansen Butte.....	* 24,000	.....	.....	4,000	12	(⁹)	Do.
Wood River.....	* 40,000	.....	.....	4,200	14	(¹⁰)	Do.
Dubois.....	* 200,000	.....	.....	4,800	15	(¹¹)	Do.
Idaho Falls pumping.....	* 100,000	.....	.....	4,700	15	(¹²)	Do.
Montana:							
Milk River—							
Chinook division.....	.....	50,000	.....	.....	.....	.....	Do.
Beaver Creek division.....	10,000	.....	708	2,200	14	1,700,000	Ready.
Cut Bank.....	* 25,000	11,000	.....	3,800	13	1,200,000	Not ready.
Sun River.....	35,000	30,000	.....	4,100	11	4,000,000	Ready.
Bitter Root.....	.....	30,000	.....	3,450	11	1,500,000	Not ready.
Judith Basin.....	.....	36,500	.....	4,300	17	2,505,000	Do.
Missoula-Huson.....	.....	8,100	.....	3,100	16	313,000	Do.
Helena Flats.....	.....	15,000	.....	2,800	16	450,000	Do.
Nebraska:							
North Platte extensions.....	65,000	88,000	10,000	4,100	13	9,000,000	Ready.
Dawson County.....	.....	45,000	.....	2,700	22	2,500,000	Not ready.
Farmers Canal.....	.....	50,000	.....	2,600	22	2,000,000	Do.
Nevada:							
Upper Carson.....	3,500	35,500	.....	4,800	12	2,000,000	Ready.
Pyramid Lake.....	15,000	1,000	.....	4,000	4	1,200,000	Do.
Humboldt River.....	.....	* 90,000	.....	4,200	9	9,000,000	Not ready.
New Mexico:							
San Juan.....	* 125,000	.....	.....	5,200	8	(¹³)	Do.
Middle Rio Grande drainage.....	.....	100,000	.....	4,800	7½	5,500,000	Ready.
Oregon:							
Klamath pumping units.....	.....	23,000	.....	4,100	12	1,200,000	Do.
Langell Valley.....	.....	17,000	.....	4,200	12½	1,000,000	Do.
Horsedy storage.....	2,000	1,400	.....	4,100	12½	300,000	Not ready.
Tule Lake.....	17,000	.....	.....	4,000	14	1,250,000	Ready.

¹ These estimates must be considered as merely preliminary and subject to change.

² Indian.

³ Lands not classified; classification shown is assumed.

⁴ No estimate.

⁵ In Fort Hall Indian Reservation.

⁶ In Targhee National Forest.

⁷ In Navajo Indian Reservation.

Projects and extensions of projects investigated by the Reclamation Service in the Western States—Continued.

State and project.	Irrigable acreage.			Mean altitude.	Mean rainfall.	Probable cost. ¹	Readiness for construction.
	Public.	Private.	State.				
Oregon—Continued.				<i>Feet.</i>	<i>Inches.</i>		
Rogue River.....		30,000		1,600	20	\$2,000,000	Not ready.
Greater Umatilla.....	3,500	12,000		500	8½	3,100,000	Do.
Owyhee.....	6,000	13,050					
Deschutes.....		17,000		2,200	10	2,100,000	Do.
Lower Powder River.....	38,000	200,000		3,200	9	12,000,000	Do.
South Dakota:		25,000		3,000	13	7,000,000	Do.
Belle Fourche extension.....	11,000	22,300	3,917	2,800	14½	700,000	Do.
Texas:							
Tornilla-Fort Hancock unit.....		27,000		3,500	8	1,200,000	Do.
Lower Rio Grande.....		600,000		80	26	(²)	Do.
Utah:							
Castle Peak.....	70,000			5,200	9	7,000,000	Do.
Price River.....	30,000			5,500	12	(²)	Do.
Dixie.....	30,000			2,000	8½	(²)	Do.
Utah Valley drainage.....		30,000		4,500	18	1,000,000	Do.
East Juab County.....		30,000		5,000	13	5,000,000	Do.
Washington:							
Yakima High Line.....	13,600	130,000	6,000	1,000	7	20,000,000	Do.
Kittitas.....	5,000	62,500	2,500	1,800	9½	8,500,000	Ready.
Methow-Okanogan.....		42,000		1,000	12	(²)	Not ready.
Kannewick Irrigation district.....	6,400	27,500	1,100	600	7	6,125,000	Do.
Wyoming:							
Frannie extension.....	35,000	1,000	1,800	4,200	6	500,000	Ready.
Heart Mountain unit.....	34,100	1,500	3,200	4,900	6	3,300,000	Not ready
Willwood unit.....	14,700	320	600	4,300	6	900,000	Ready.
Oregon Basin.....	68,000			4,500	6	(²)	Not read

¹ Railroad.² 17,000 withdrawn under Carey Act.³ Lands unclassified; classification is assumed.⁴ No estimate.

Sufficiency of water supply.—In contrast with conditions in many parts of the arid region, which have been more or less adversely affected by drouth, the reclamation projects have in general enjoyed the benefits of an ample water supply. The scarcity of water which obtained last year on the small Okanogan project in Washington has continued, but the efforts of the service in supplementing the scanty supply by wells and pumping plants and those of the settlers in conserving water by intensive cultivation have resulted in saving the highly productive and valuable orchards from destruction. During the present season a shortage of water also developed on the Orland project in California and on the Newlands project in Nevada. On the Orland project conservation measures were being taken to relieve the situation, which, however, was not extremely serious. On the Newlands project the situation can be materially relieved by clearing the channel below the outlet to Lake Tahoe, and at the end of the fiscal year negotiations were under way to effect this result.

The scarcity of water on lands ordinarily dry farmed has resulted in stimulating interest in the benefits of irrigation and the advantages of owning homes on those projects where the sufficiency of the water supply is practically assured.

Irrigation and citizenship.—The advantages of irrigation are illustrated by the statistical fact that the annual farm census of the Recla-

mation Service shows the value of products on reclamation projects to be just about twice as large per acre as the average yield of un-irrigated land in the humid region. Of course, as the arid region is approached this discrepancy becomes much greater, and it is common to find land which is irrigated bearing a value fully ten times as great as adjacent lands without irrigation which are nevertheless farmed on a dry-farming basis. This shows the value of a complete and reliable water supply.

The main reason for the productivity of irrigated lands is the ability to apply water in just the quantity needed and to withhold it at will. But lands in the arid region have more mineral plant food in the soil as a rule and receive a larger amount of sunshine than those in similar latitudes in the humid region. These factors assist in producing the higher results obtainable, and in addition this and other surrounding circumstances tend to greater care in planting and cultivating the crops that are irrigated, where such attention is sure to bring large results. As a consequence of these causes we have closer settlement, more intensive cultivation, and much higher product under irrigation, which tends to encourage rural cooperation in other respects, and such cooperation is in fact enforced by the necessity of community use of the irrigation system in cases which are not adapted to individual construction or operation. Such cooperation tends strongly to develop the community conscience and public spirit, which is one of the important distinctions between civilized and barbarous communities. The character of civilization produced by irrigated agriculture therefore has a tendency to create a higher order of citizenship than is the result without it.

Increase in irrigated area and crop value.—The following table shows the progressive increase in irrigable acreage, irrigated acreage, cropped acreage, and crop value since 1913. These figures, it should be particularly noted, relate only to those areas on the reclamation projects proper which are covered by crop statistics, and do not include an almost equally large area receiving either a complete or partial water supply under the Warren Act from the irrigation works constructed by the service. Including these areas, from which no crop statistics are secured by the service, it is estimated that the value of crops produced in 1919 amounted to nearly \$140,000,000.

Year.	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.
1913.....	1,181,362	694,142	637,227	\$15,676,411
1914.....	1,240,875	781,271	703,424	16,475,517
1915.....	1,330,222	814,906	737,613	18,164,462
1916.....	1,405,452	922,821	853,291	32,815,972
1917.....	1,602,468	1,026,663	906,784	56,462,313
1918.....	1,601,934	1,119,566	1,051,193	66,821,396
1919.....	1,636,169	1,187,265	1,113,469	88,974,137

Seepage and drainage.—Adequate drainage becomes, sooner or later, a matter to be dealt with on practically every project, and only the proper solution of the problem will result in preventing or checking seepage and waterlogging of the soil and deposits of alkali in amounts sufficient to deter plant growth and cause abandonment of the affected area.

To a large extent the drainage problem is closely allied with that of excessive use of water, although this is by no means true in all cases. However, many factors in the problem will eventually be eliminated or lessened by insistence on the highest standards in the use of water, with stress laid upon the desirability of introducing the rotation system of water delivery wherever practicable.

Irrespective, however, of the methods employed in the delivery of water, there will always be a drainage problem, more or less serious, on most projects, since the escape of some water to the lower levels can not be avoided. Here the excess water joins ground water, with a consequent rise in the water table and a resultant condition of seepage, which can be corrected only by adequate drainage systems. A large part of the funds available to the service necessarily has been and must continue to be employed in the construction of these drainage works. The results accomplished in protecting threatened areas and in reclaiming areas already seeped and waterlogged fully justify the cost.

Reclamation project operations.—The Salt River project in Arizona is being operated by the local organization of water users under a contract by which the Secretary of the Interior turned over the works and the income of the large power plants which were constructed in connection with the project. The project is in a prosperous condition and the income from power is more than sufficient to pay the construction charges. The Government's present activity in connection with this project is confined to occasional inspection and supervision, as provided in the contract. The ground water is rising on the project and will require early attention in order to prevent injury to a considerable area of land. This condition has been investigated by the water users' association and plans are now under way to provide for well drainage on certain low areas of the project.

On the Yuma project, Arizona-California, the Yuma Valley, which lies in Arizona, has been placed under public notice, but the payments are being contested by the water users' association. Final decree was rendered in favor of the service but supersedeas order was issued in the matter of the water users' appeal and the time for the water users to perfect their appeal has been extended until the October term of court. The Yuma Valley is very prosperous and the gross crop value per acre for the year 1919 amounted to \$134, exclusive of the live-stock increase. The Yuma Auxiliary project

was created by special act of Congress of January 25, 1917. Public notice providing for the sale of public lands of the first Mesa unit of this project was issued on October 3, 1919, and of the 532 farm units in the first Mesa unit, 518 had been sold during the fiscal year, involving a gross area of 6,096.23 acres. Contracts have been executed providing for the construction of certain features of the first Mesa unit.

The Orland project in California is regarded as the first unit of a comprehensive project for the development of the Sacramento River. It is, however, a self-supporting project, with an ample water supply from Stony Creek, a tributary of the Sacramento River, and is practically completed. Public notice on this project issued in 1916 and all payments are made promptly when due by the association as a whole. The project is prosperous and is constantly growing in development. The only construction work in progress is some permanent canal lining to prevent seepage, which is being done by supplemental construction under public notice.

The Grand Valley project in Colorado is delivering water on a rental basis, as public notice has not yet been issued. The conditions on the project are showing a steady development, and the majority of the settlers now have their farms on a paying basis. The project is practically completed, except for the construction of a drainage system, which is well under way.

The Uncompahgre project, Colorado, is being operated on a rental basis under contract with the water users' association. The contract provides that the operation of the project may be turned over to the association whenever they so elect, and also provides for operation on a rental basis for a period of five years, when the project is to be opened under public notice, at which time construction payments will begin. The project is practically completed, except for the possible enlargement and improvement of some of the distribution systems which are now operated by the farmers. Water is being furnished on a continuous-flow basis, with its resultant waste and aggravation of the seeped areas. Efforts are being made to change the system of delivery to the acre-foot basis. The project is developing slowly but steadily, and the settlers are on the whole in a prosperous condition.

The Boise project in Idaho includes the Arrowrock and Dear Flat Reservoirs, which have been completed, and a canal system which now delivers water to the main body of the project. Public notice was issued in 1917 announcing the charges on the completed portions of the project, but the water users brought suit to escape a portion of the repayment and the case is still pending. In addition to the main project the United States, under special contracts, delivered storage water to about 150,000 acres of lands that are served by independent

systems. The full storage capacity of both the Arrowrock and Deer Flat Reservoirs was available during the irrigation season. The project as a whole is in a very prosperous condition.

The King Hill project, in Idaho, is being reconstructed under the terms of the contracts entered into with the King Hill irrigation district. The total of the reconstruction work involved amounts to \$1,600,000, and the work is being done during the nonirrigation seasons. The project is being operated and maintained by the district. The climate is favorable for the early marketing of produce, and as a result the settlers are in a prosperous condition.

The Minidoka project in Idaho, as originally planned, has been completed but several extensions are possible and desirable and preliminary surveys are under way in connection with the irrigation of a large acreage under the north side pumping unit. The project at present consists of two units, a gravity unit and a pumping unit. The gravity unit is operated by an irrigation district under contract with the United States. The pumping unit on the south side of the river, the common headworks, power system and storage are operated by the United States. The current year has been one of exceptional drought and it was necessary to draw upon the stored water early in June and to cut the project diversions to about two-thirds the normal supply in the middle of July. Little damage resulted to the crops, and on the whole the project settlers are in a very prosperous condition.

The Huntley project is one of the most thickly settled projects of the service. The project is practically complete except for the drainage program, little work on which was done during the year owing to existing labor conditions. The water supply was below normal throughout the season owing to the very light snowfall on the Yellowstone watershed during the winter of 1918-19, but the supply for the project was ample.

In the Milk River Valley, Mont., a supplemental supply of water is obtained from the St. Mary storage unit for use on the Milk River project. Both the St. Mary storage unit and the distribution units in Milk River Valley are still in the process of construction and all water used for the irrigation of lands in the Milk River project is furnished on a rental basis. The water supply available during the season was sufficient for the lands now under irrigation.

On the Sun River project, Montana, the Fort Shaw unit, on the south side of Sun River, is completed, and is being operated under public notice. It was necessary to draw on the Willow Creek Reservoir storage for the first time in the history of the project in order that a sufficient supply might be available for the needs of the Fort Shaw unit. The settlers on the Fort Shaw unit are in a prosperous condition. The other units of the project are still in process of

construction, and water for the first time was furnished during the season of 1919 on a rental basis to lands under the Greenfields unit.

The Lower Yellowstone project, in Montana and North Dakota, is practically complete for present purposes, and no construction work thereon was done during the fiscal year. Water was supplied on a rental basis during the past season, and about 50 per cent of the acreage for which the service was prepared to supply water was irrigated. Good crop results were obtained from the irrigated lands. Irrigation districts have been formed in both States, and on the whole the project is showing a steady, though not rapid, development.

The North Platte project in Nebraska and Wyoming is one of the largest, as well as one of the most successful, of the reclamation projects. The Interstate unit on the north side of the North Platte River is being operated under public notice, and the settlers thereunder are in a prosperous condition. The construction work on this unit is completed except for the completion of the drainage system. The Fort Laramie unit on the south side of the river is under construction, and certain areas of the unit are being furnished water on a rental basis. About 5,100 acres of additional lands under this unit were thrown open to entry during the spring of 1920, and the development of the unit is fast keeping pace with its construction.

The full development of the Newlands project in Nevada is being delayed for two reasons: First, the lack of a deep drainage system; and, secondly, the lack of additional storage. It is now anticipated that a contract will be entered into with the district at an early date for the construction of a deep drainage system. Legal and other obstacles are in the way of a proper regulation of Lake Tahoe in order to secure additional storage. The main canals have been constructed, and the project is being operated under public notice, except certain areas which are furnished water on a rental basis. The construction work during the year consisted principally of the extension of the lateral system to serve new lands. The water supply during the past year was deficient.

The Carlsbad project in New Mexico is being operated under public notice and is completed. The project is showing a steady development year by year, and the settlers are in a prosperous condition.

The Rio Grande project in New Mexico and Texas is being operated on a rental basis and served from the storage water of the Elephant Butte Reservoir. The flat topography of the valley, the character of the soil, and the wasteful use of water in the past have brought up the water table over most of the valley, and much of the land has been injured. The drainage system planned to relieve this condition is over 50 per cent completed, and the results so far have been highly successful. No other construction work was done during

the year except the construction of new laterals and the reconstruction of old laterals. The irrigable area surveys are under way preparatory to the opening up of the project under public notice.

The North Dakota pumping project was operated for the first time in four years, and the results are encouraging for the future success of the project. The stipulated cost of the construction and improvement work will be returned, together with the operation and maintenance cost, in accordance with the terms of the existing contract with the Williston irrigation district. The coal mine, power plant, and transmission lines were operated as usual in connection with the sale of commercial power.

The Umatilla project in Oregon is being operated under public notice. Difficulties are encountered with drifting sand and the porous character of the soil in certain restricted areas which demand large quantities of water and do not respond readily to irrigation. The construction charges on these lands have been temporarily suspended. Good progress was made on the lining work of the main canal of the east side in order to prevent excessive losses through the porous soil. The settlers, on the whole, are in a prosperous condition.

The Klamath project in Oregon and California is being gradually extended as the waters of Tule Lake recede, owing to evaporation and the prevention of inflow. A certain portion of the Tule Lake lands is included in the third unit, and the balance is being leased pending the construction of an irrigation system. Drainage construction is practically completed on the first unit, and the results have been successful. The irrigated land is productive, and as a rule the settlers are in a prosperous condition.

The Belle Fourche project in South Dakota is being operated under public notice. The water supply for lands under the storage system was sufficient throughout the irrigation season, but there was a shortage on lands dependent on natural flow, which constitute about 5 per cent of the project. Plans are under way for an extension of the project in the Willow Creek district. Drainage is necessary in certain sections, but no such work was done, as arrangements have not been made for the repayment of the cost. The project showed a steady development during the year, and the settlers on the whole are in a prosperous condition.

On the Strawberry Valley project in Utah the principal work constructed by the Government is a storage reservoir in the Strawberry Valley on the headwaters of the Duchesne River and a 4-mile tunnel through which the reservoir storage is diverted to the westward slope of the Wasatch Range. The irrigation system has been completed and is being operated by the various districts under special contracts. The operation of the power canal is carried on by the service, and the

power developed is being sold to the various towns and project industries. There are still some water rights in the Strawberry Reservoir for sale. The settlers are in a prosperous condition, and payment of the construction charges is being made regularly and promptly.

The serious water shortage of the past two years on the Okanogan project is continuing during the year 1920. An oil-engine-driven generating plant has been completed and three wells have been sunk to provide and develop an additional supply. Practically only the orchard land is being irrigated. Work is in progress on the enlargement of the reservoirs to provide additional holdover capacity. The crop returns per acre were the highest of any of the projects.

The Yakima project, in Washington, includes six storage reservoirs and seven irrigation units. Four storage reservoirs are completed and the irrigation systems for the Sunnyside and Tieton units are also practically completed. Construction plans and surveys have been completed for two additional units and contracts are pending for the investigation of two other units. Water was furnished the two completed units under public notice and the settlers thereunder had a highly profitable year, as the total crop return on the Sunnyside and Tieton units was over 60 per cent in excess of the cost of construction. The Yakima project is one of the foremost in general prosperity and the returns per acre during the past year were exceeded only by those on the Okanogan project.

On the Shoshone project, in Wyoming, certain units of the project are being operated under public notice, and the project is gradually being extended by the construction of additional units on the north side of the Shoshone River. The seventh and eighth units were opened to settlement during the fiscal year. The drainage work was continued throughout the year and such work has been uniformly successful. The settlers on the project are in a prosperous condition. Consideration is being given to plans for the development of a unit on the south side of the Shoshone River.

Three extremely dry years—1917, 1918, and 1919—throughout a large portion of the West have broken all records for drought and many private irrigation projects have suffered for lack of water. The outlook for 1920 appears to be little better. As a result, dry farming has been a failure and there is much demand for irrigated lands.

Summary of construction results.—The following table gives in concise form a review of the work done by the service to June 30, 1920. During the fiscal year the amount of excavation totaled more than 5,800,000 cubic yards.

Summary of construction results, June 30, 1920.

Items.	To June 30, 1920.		To June 30, 1919.		Increase.	
Reservoir capacity available (original).....	<i>Acre-feet.</i> 9,441,910		<i>Acre-feet.</i> 9,430,910		<i>Acre-feet.</i> 11,000	
<i>Canals, ditches, and drains.</i>						
Canals:	<i>Miles.</i>		<i>Miles.</i>		<i>Miles.</i>	
Over 800 second-feet capacity.....	457		438		19	
301 to 800 second-feet capacity....	678		670		8	
50 to 300 second-feet capacity....	1,975		1,919		56	
Less than 50 second-feet capacity..	7,939		7,807		132	
Total canals.....	11,049		10,834		215	
Waste-water ditches.....	700		665		35	
Drains:						
Open.....	737		623		114	
Closed.....	179		172		7	
Total.....	1,616		1,460		156	
Grand total.....	12,665		12,294		371	
<i>Tunnels.</i>						
Number.....	95		95			
Length (feet).....	143,847		143,847			
<i>Storage and diversion dams.</i>						
	<i>Cubic yards.</i>		<i>Cubic yards.</i>		<i>Cubic yards.</i>	
Masonry.....	2,088,251		2,087,991		260	
Earth.....	10,531,663		10,220,671		310,992	
Rock fill and crib.....	1,207,381		1,203,386		3,995	
Total.....	13,827,295		13,512,048		315,247	
<i>Dikes and levees.</i>						
Length and volume.....	<i>Feet.</i>	<i>Cubic yds.</i>	<i>Feet.</i>	<i>Cubic yds.</i>	<i>Feet.</i>	<i>Cubic yds.</i>
	514,039	4,518,214	513,989	4,517,664	50	550
<i>Canal structures—Number.</i>						
	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>
Costing over \$2,000.....	1,081	209	1,044	201	37	8
Costing \$500 to \$2,000.....	2,134	605	2,100	528	34	77
Costing \$100 to \$500.....	10,327	6,345	9,896	5,870	431	475
Costing less than \$100.....	19,682	62,130	19,682	57,824		4,306
Total.....	33,224	69,289	32,722	64,423	502	4,866
Grand total.....	102,513		97,145		5,368	
<i>Bridges.</i>						
	<i>Number.</i>	<i>Length(ft.).</i>	<i>Number.</i>	<i>Length(ft.).</i>	<i>Number.</i>	<i>Length(ft.).</i>
Steel.....	106	8,579	106	8,579		
Combination.....	414	12,542	414	12,542		
Wood.....	6,424	143,800	6,134	135,218	290	8,382
Concrete.....	349	4,543	346	4,399	3	144
Total.....	7,293	169,264	7,000	160,738	293	8,526
<i>Culverts.</i>						
Concrete.....	2,038	101,176	1,930	95,088	108	6,088
Metal.....	1,617	57,042	1,560	54,929	57	2,113
Terra cotta.....	1,556	66,362	1,505	64,096	51	2,266
Wood.....	4,189	101,801	4,049	96,492	140	5,309
Total.....	9,400	326,381	9,044	310,605	356	15,776
<i>Pipe.</i>						
	<i>Linear feet.</i>		<i>Linear feet.</i>		<i>Linear feet.</i>	
Concrete.....	640,334		628,572		11,762	
Metal.....	251,659		247,136		4,523	
Terra cotta (tile).....	1,316,872		1,270,375		46,497	
Wood.....	499,472		495,432		4,040	
Total.....	2,708,337		2,641,515		66,822	

Summary of construction results, June 30, 1920.—Continued.

Items.	To June 30, 1920.		To June 30, 1919.		Increase.	
<i>Flumes.</i>	<i>Number.</i>	<i>Length (ft.).</i>	<i>Number.</i>	<i>Length (ft.).</i>	<i>Number.</i>	<i>Length (ft.).</i>
Concrete.....	90	38,978	85	27,658	5	11,320
Metal.....	967	186,177	960	189,072	7	7,106
Wood.....	2,250	463,209	2,141	449,569	109	13,640
Total.....	3,307	686,364	3,186	636,299	121	82,065
<i>Canales Mads.</i>	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>	<i>Concrete.</i>	<i>Wood.</i>
Length.....miles..	333.88	4.11	307.57	4.10	26.31	.01
Total.....	337.99		311.67		26.32	
<i>Buildings.</i>	<i>Number.</i>		<i>Number.</i>		<i>Number.</i>	
Offices.....	99		97		2	
Residences.....	659		636		23	
Power plants.....	31		29		2	
Pumping stations.....	118		89		29	
Barns, storehouses, etc.....	543		523		20	
Total.....	1,450		1,374		76	
<i>Wells.</i>	<i>Number.</i>	<i>Depth (ft.).</i>	<i>Number.</i>	<i>Depth (ft.).</i>	<i>Number.</i>	<i>Depth (ft.).</i>
Number and depth.....	499	49,162	448	47,879	51	1,283
<i>Communications.</i>	<i>Miles.</i>		<i>Miles.</i>		<i>Miles.</i>	
Roads.....	986		970		16	
Railroads.....	83		83			
Telephone lines.....	3,145		3,126		19	
Transmission lines.....	650		615		35	
Total.....	4,864		4,794		70	
<i>Power developed.</i>	<i>Horsepower.</i>		<i>Horsepower.</i>		<i>Horsepower.</i>	
Water and steam.....	60,373		59,633		740	
<i>Excavation.</i>	<i>Cubic yards.</i>		<i>Cubic yards.</i>		<i>Cubic yards.</i>	
Class 1, earth.....	159,876,598		154,473,487		5,403,111	
Class 2, indurated material.....	10,175,545		9,913,065		262,480	
Class 2, rock.....	8,599,998		8,409,722		190,276	
Total.....	178,652,141		172,796,274		5,855,867	
<i>Riprap.....cubic yards..</i>	2,001,420		1,892,728		108,692	
<i>Paving.....square yards..</i>	832,736		819,408		13,328	
<i>Concrete.....cubic yards..</i>	3,047,045		3,023,446		23,599	
<i>Cement.....barrels..</i>	3,016,375		2,971,330		44,045	

Irrigation and crop results, 1919.—The works of the Reclamation Service in 1919 served areas aggregating about 2,650,000 irrigable acres, including 1,636,000 acres for which the Government systems furnished the sole supply of irrigation water and 1,012,000 acres to which in most cases the service furnished stored water in bulk to supplement the partial supply of private systems otherwise dependent on unregulated stream flow. Of the first class 1,187,000 acres were actually irrigated and 1,114,000 harvested, producing crops worth \$89,000,000, or about \$80 per acre cropped. Of the other class, from less complete information, it is roughly estimated that 916,000 acres were irrigated and 880,000 acres cropped, yielding crop products worth \$64,000,000.

As suggested by the foregoing, the lands served by the works built under the Federal reclamation law may for statistical purposes be

conveniently considered as of two classes. The first class comprises lands for which the United States under the reclamation act of June 17, 1902, has in general built a complete system of irrigation works from the point of storage to that of delivery to each farm or group of farms. These are the lands commonly referred to as the Government projects and include those tracts that under Government aid have been converted from sagebrush desert to productive farms. Here the Government works are the sole source of irrigation water and the control of the Reclamation Service commonly extends throughout the system of lateral canals that deliver the water to each farmer. Thus the service has a force of ditch riders in frequent touch with the irrigators. This provides a ready means of gathering census data of more than ordinary accuracy and at little or no extra expense, since the time for collecting these coincides with that when the water deliveries are dwindling in the fall, and the ditch riders, while still required for occasional deliveries, have less onerous duties in connection with the operation and protection of the system.

The other class of lands benefited by the Government works includes those served under the Warren Act of February 21, 1911. This important supplement of the reclamation act provides a connecting link between the Government works and private canal systems built in the same vicinity or drainage basin. The latter commonly lack storage, depending originally on the unregulated flow of the streams alone. This natural flow often declines in the irrigation season to a point far below the needs of all the constructed canals and the typical case of service to such canals and lands from the Government works involves furnishing stored water at such times from the reservoirs built by the Reclamation Service. This may be simply delivered in bulk in the river channel or the service may include carriage through other Government works and delivery at various stages of the process of distributing water to the individual farms. Similarly the quantities of water made available by the Government works in such cases vary from a complete supply to a small percentage of the total water used by the irrigators. Even where only a portion of the total water used is furnished, it may be a vital part and double the crop yield that would otherwise be secured.

Not only do these things differ widely between the various cases or contracts under the Warren Act, but in the case of any particular contract or canal the delivery from the Government works may vary materially with the stream flow during the delivery period and from year to year with variation in the total run-off. These peculiar conditions and variations make it difficult or impossible in such cases to express in irrigation and crop statistics results attributable to the Government works, and as the Reclamation Service usually furnishes

the water far from the point of delivery to the farmers it has no organization of ditch riders or others through whom such statistics can be readily and cheaply secured as in the case of the Government projects proper. For these reasons past annual reports of the Reclamation Service have not included such statistics. For 1919, however, an effort was made to get a reasonable estimate of such results, using readily available sources of information, such as any statistics gathered by managers of the private systems or irrigation districts involved, records of sugar-beet factories, alfalfa mills, freight shipments, etc. The resulting estimates of acreages and crop values are given in the second part of the table following.

The first columns of this table give the better known and more significant figures for the Government projects proper; that is, the lands of the first class above described. For these the usual census of irrigation and crop results, as described in previous annual reports, was continued during the period covered by the present report. Obviously such information is not adapted to fiscal years and the figures that follow are for the last growing season or calendar year, that of 1919. On the Salt River project, Arizona, where some crop is growing at all times of the year, a convenient period is taken as the agricultural year from October 1 to September 30, which date approximately marks the transition from the heavy summer production to the winter crops. On that project operation and maintenance of the works built by the Government have been turned over to the Salt River Valley Water Users' Association, and in the following statistics of crop production the figures for that project were gathered and furnished by the association. Similarly on the gravity unit of the Minidoka project, Idaho, the Minidoka irrigation district handles the operation and maintenance and has compiled the crop data.

On the King Hill project, in the same State, the data are furnished by the King Hill irrigation district. The showing on this project is affected by the unsatisfactory condition of the canal system. This was built under private auspices and the United States has undertaken its reconstruction. This work is under way, but not sufficiently completed to insure the water supply for the bulk of the project. The Government has not undertaken operation and maintenance on this project, which are handled by the district.

On several projects units of some magnitude have been added to the irrigable area in recent years or are coming in by canal extensions now under way. On such units, involving the operation of new canals, new settlers, and newly cultivated lands, although potentially as valuable, it is not to be expected that crop production will be as great as on older tracts. In some cases, therefore, the figures for such units have been given separately. These include the Fort

Laramie unit of the North Platte project, the Greenfields division, Sun River project, and the Frannie unit of the Shoshone project.

It will be noted that these reports do not give the total values of farm products, in that they include nothing from farm animals. The project census does not cover the income from live stock or stock products, but it is known that large additional returns are realized from sales of animals, poultry, dairy products, wool, and honey. However, the crop reports give some impressive figures of the values that have been secured from desert lands by the provision of irrigation water. The following table summarizes the reports by projects, and it will be noticed that for several of these the crop values produced average over \$100 per acre. These averages are for all farms and all crops in the large tracts covered by the census, including the least successful with the most successful irrigators and averaging with banner crops those of low yield or any of entire failure due to pests or other causes. The average returns per acre, therefore, are an index for a large area in each case, and far greater results are secured by many of the most skilled and successful settlers.

Irrigation and crop results, Government reclamation projects, 1919.¹

State and project.	Lands on projects proper, covered by crop census.				Other lands served by Government works, usually a partial water supply through private canals under Warren Act contracts.				
	Irrigable acreage. ¹	Irrigated acreage.	Cropped acreage. ²	Crop value.		Irrigable acreage.	Cropped acreage.	Crop value.	
				Total.	Per acre.			Total.	Average per acre.
Arizona:									Approximate percent of total water used sup- plied by United States.
Salt River.....	4,212,966	4,265,064	188,332	\$23,768,682	\$126.27				
Arizona-California:									
Yuma.....	70,000	53,284	52,324	7,012,209	134.00				
California:									
Orland.....	20,533	15,203	12,409	862,289	71.90				
Colorado:									
Grand Valley.....	35,000	10,049	8,990	570,629	64.12	8,350	7,760	\$1,780,000	\$224.21
Uncompahgre.....	100,000	60,906	69,746	3,391,456	56.76			\$8,203,560	\$99.97
Idaho:									
Boise.....	122,772	103,782	99,083	6,254,904	63.12	140,788	120,500	\$8,203,560	\$99.97
King Hill.....	14,500	4,993	3,969	219,246	55.39				
Minidoka.....	72,889	59,589	57,068	3,364,049	58.95	626,840	570,000	34,610,400	63.38
Gravely unit.....	48,976	45,000	41,780	2,562,210	61.52				
Pumping unit.....									
Montana:									
Huntley.....	31,265	19,310	19,310	948,968	49.14				
Milk River.....	67,000	25,485	24,069	600,864	24.93	20,440	15,200	365,000	24.00
Sun River.....									
Fort Shaw division.....	14,023	8,186	8,292	348,820	42.07				
Greenfields division No. 1.....	10,267,000	3,310	2,902	23,516	8.20				
									87

¹ Data are for calendar year (irrigation season), except on Salt River project, where data are for corresponding "agricultural year," October, 1918, to November, 1919.

² Areas Reclamation Service was prepared to supply water.

³ Irrigated crops. Excludes small areas in few projects cropped by dry farming.

⁴ Includes so-called "dry lands," given right to rent water temporarily on account of ample storage.

⁵ Includes 3,100 acres within town sites, about 8,500 acres reported "vacant land" in some of which are roadways, ditches, etc., and over 5,000 acres of home tracts including houses, lots, corrals, etc.

⁶ All areas shown are those on which detailed crop census was taken.

⁷ Data furnished mainly by King Hill Irrigation district. System was built under private auspices.

⁸ Crop reports covered an additional area of 7,287 acres cropped by dry farming, producing crops worth \$39,150, or \$5.37 per acre.

⁹ Figures are for 136 irrigated farms, which included small tracts farmed without irrigation. In addition two units farmed "dry" reported 3 acres of hay valued at \$75 and 20 acres of pasture valued at \$120. Irrigated area includes 10 acres in United States reserve, town sites, etc.

¹⁰ Limited by water available. The figure is approximate area under ditch.

Irrigation and crop results, Government reclamation projects, 1919—Continued.

State and project.	Lands on projects proper, covered by crop census.					Other lands served by Government works, usually a partial water supply through private canals under Warren Act contracts.					
	Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.		Irrigable acreage.	Irrigated acreage.	Cropped acreage.	Crop value.		
				Total.	Per acre.				Total.	Average per acre.	
Montana-North Dakota: Lower Yellowstone. Nebraska-Wyoming: North Platte. Interstate unit. N. P. C. & C. Co. lands. Fort Laramie.	42,167	21,300	21,289	\$899,117	\$40.82						
Nevada: Newlands. New Mexico: Carlsbad. New Mexico-Texas: Rio Grande. North Dakota: North Dakota pumping.	111,915 17,800 12,132	88,990 10,428 6,268	88,690 10,352 6,268	3,916,736 363,718 143,367	45.71 35.13 22.91	105,400	83,400	83,400	\$5,356,500	\$64.20	63
Oregon: Umatilla. Oregon-California: Klamath. South Dakota: Belle Fourche. Utah: Strawberry Valley.	65,809 24,991 107,000 12,238 24,501 50,000 82,634 50,000	44,324 20,363 77,083 2,446 10,633 37,881 56,265 33,122	43,296 18,763 72,170 2,370 8,464 32,688 56,265 29,265	1,840,660 1,988,546 3,825,107 69,990 633,380 869,806 1,962,683 1,973,099	41.66 106.04 53.00 29.53 74.83 26.30 34.89 67.50						
Washington: Okanogan. Yakima. Sunnyside unit. Tieton unit.	10,099 100,130 32,000	5,849 90,000 27,000	5,314 76,886 26,300	1,951,475 12,678,247 4,083,168	367.28 167.07 154.10	100,000	94,000	87,000	12,000,000		
Wyoming: Shoshone- Gaiand unit. Franklin unit.	56,119	34,697 6,944	34,183 6,833	1,708,644 178,333	49.98 26.10						
Total.	1,636,159	1,187,255	1,113,469	88,974,137	79.86	1,011,815	916,313	880,613	64,004,750	72.70	

¹¹ For crops in full production, excluding 10,247 acres of wild-grass pasture, and 4,205 acres otherwise not in full production. For all crops, \$42.50.

For all the Government projects proper the crop reports show a gross value of about \$89,000,000, or an average of almost \$80 for each of nearly 1,114,000 acres cropped. These reports covered an irrigated acreage of 1,187,000 and 1,636,000 acres that were irrigable, i. e., for which the works were ready to supply water. The difference between the areas irrigated and cropped, i. e., the acreage irrigated in 1919, but producing no crop that year, includes young fruit trees short of bearing and alfalfa seeded in the fall.

The larger discrepancy between irrigable and irrigated areas does not indicate a failure to utilize 450,000 acres and the water ready for it. A part of this balance on a few of the most easterly projects is cultivated or pastured without irrigation, often combining such operations with the more intensive ones of irrigation on the same farms. Another portion of the balance is public land which, though under ditch, is withheld from entry for a seasoning of canals or other action preliminary to inviting in settlers. A small part is public land awaiting entry. Other tracts are State, railroad, or Indian land, more or less in process of subdivision and transfer to settlers.

But the largest part of the unirrigated land for which water is ready comprises a great number of small pieces of the irrigated farms. The figure given as irrigable agrees with the official farm-unit plats and is the total irrigable area on which water charges are based, but necessarily a part of this is taken up by the farmers' ditches, buildings, roads, and canals, so that it can not be cultivated. On this account the most complete use of the irrigable area to be ultimately expected will show the irrigation of from 80 to 90 per cent. Also the new settler of ordinary means can not put his whole unit to use the first year, nor the second, but gradually adds to the area leveled, cultivated, and irrigated. For this reason the irrigated area lags behind the irrigable, both increasing each year as new farms are brought under the extended canal systems and the older ones progress toward complete cultivation.

For the Salt River project, Ariz., the water users' association reported a total crop value of over \$23,000,000. Under the contract by which the association assumed the operation and maintenance of the works and agreed to reimburse the United States for their construction, the amount fixed for the latter purpose is approximately \$10,279,000. Thus the crop value in a single year is more than twice the amount the association is to repay to the United States over a period of 20 years and most of this will be supplied by power profits from the project works. On other projects the development has reached the stage where the annual crop value is comparable to the total cost of

building the irrigation works, as indicated in the following tabulation:

Project cost and crop values.

[Figures slightly rounded.]

Project.	Value of irrigated crops, 1919.	Net construction cost to June 30, 1920.	Operation and maintenance cost, 1919.
Salt River, Ariz. ¹	\$28,768,000	\$10,548,000	(¹)
Yuma, Ariz.-Calif.....	7,012,000	8,980,000	\$238,500
Orland, Calif.....	892,000	965,000	33,200
Minidoka, Idaho ²	5,928,000	5,820,000	\$ 143,200
Carlsbad, N. Mex.....	1,989,000	1,380,000	58,200
Okanogan, Wash.....	1,851,000	1,093,000	33,500
Yakima, Wash. ³	16,731,000	10,150,000	\$ 210,000

¹ Works operated by water users' association.

² Gravity unit operated by water users. Costs include storage works serving large area under Warren Act for which crop returns are not here included.

³ Costs include storage works serving areas under Warren Act for which crop returns are not here included.

In the following table the project reports are summarized by crops. Comparison with similar tabulations for previous years shows relatively small changes in the general character and relative importance of the crops grown. Alfalfa continues as the great basic crop, accounting for about 40 per cent of the crop area and 30 per cent of the total crop value in 1919. Grain, vegetables, and truck crops lost relatively, while fruits, sugar beets, and cotton gained. Indian corn apparently gained in favor in 1919, but occupied less than 5 per cent of the total area. Beans lost greatly in relative importance. Eight million bushels of grain, a comparable amount of vegetables and truck, 300,000,000 pounds of fruit, 350,000 tons of sugar beets, and 80,000,000 pounds of cotton, mostly long staple, were harvested from the lands covered by the crop reports. Yet over half the crop area was devoted to hay and forage crops.

Summary of crop reports on reclamation projects in 1919.

NOTE.—These figures are limited to irrigated crops covered by crop census on Government projects proper, excluding dry-farm crops and all crops on most areas served stored water under the Warren Act.

Crop.	Acreage cropped.		Yields.			Crop value.		
	Total.	Per cent.	Unit.	Total.	Average per acre.	Average per acre.	Total.	Per cent
Cereals:								
Barley.....	28,882	2.5	Bushel....	925,625	32.0	\$41.10	\$1,187,094	1.3
Corn.....	47,925	4.3	do.....	1,376,104	29.0	43.22	2,071,345	2.3
Oats.....	42,987	4.0	do.....	1,219,366	28.0	26.60	1,142,912	1.3
Rye.....	2,237	.2	do.....	23,168	10.0	16.23	36,316	.....
Wheat.....	167,211	15.0	do.....	3,491,425	21.0	42.03	7,027,924	8.0
Total.....	289,242	26.0	do.....	7,035,688	24.0	39.64	11,465,591	12.9
Other grain and seed:								
Alfalfa seed.....	9,631	.9	do.....	47,087	4.9	85.37	822,195	.9
Clover seed.....	8,663	.8	do.....	30,165	3.4	83.32	721,817	.8
Grain sorghum.....	28,145	2.5	do.....	1,053,844	37.0	45.04	1,267,673	1.4
Flaxseed.....	1,029	.1	do.....	5,089	4.9	19.00	19,308	.....
Millet seed.....	328	.....	do.....	2,080	6.3	12.90	4,225	.....
Total.....	47,796	4.3	do.....	1,138,265	24.0	59.32	2,835,218	3.1

Summary of crop reports on reclamation projects in 1919—Continued.

Crop.	Acreage cropped.		Yields.			Crop value.		
	Total.	Per cent.	Unit.	Total.	Average per acre.	Average per acre.	Total.	Per cent.
Hay and forage:								
Alfalfa hay.....	455,440	40.8	Ton.....	1,483,944	3.2	\$57.00	\$25,800,146	29.0
Clover hay.....	5,792	0.5	do.....	9,842	1.7	26.51	153,552	.2
Other hay.....	29,741	2.7	do.....	28,578	.9	21.21	630,783	.7
Corn fodder.....	4,969	.5	do.....	20,888	4.2	37.63	186,608	.2
Peas.....	4,230	.....	Bushel.....	2,576	11.0	25.55	4,877	.....
Other forage.....	4,636	.4	Ton.....	21,935	4.5	50.12	242,378	.3
Pasture.....	118,776	10.3	.....	.....	.....	15.46	1,759,486	1.9
Total.....	614,774	55.2	.....	.....	.....	47.00	28,778,832	32.3
Vegetables and truck:								
Beans.....	1,980	.1	Bushel.....	29,965	15.5	52.31	100,967	.1
Onions.....	260	.....	do.....	87,976	338.0	454.52	118,176	.1
Potatoes, white.....	30,752	2.8	do.....	4,812,602	157.0	164.78	5,068,336	5.7
Potatoes, sweet.....	744	.....	do.....	251,158	337.0	135.10	100,514	.1
Truck.....	17,008	1.6	do.....	.....	.....	151.40	2,573,334	3.0
Total.....	50,689	4.5	.....	.....	.....	157.06	7,961,327	9.0
Fruits and nuts:								
Apples.....	27,926	2.5	Pound.....	217,187,410	7,777.0	321.23	8,970,724	10.1
Peaches.....	2,629	.2	do.....	18,388,185	7,203.0	241.60	635,181	.7
Pears.....	3,989	.4	do.....	25,854,192	6,502.0	254.18	1,018,983	1.2
Prunes.....	1,086	.1	do.....	3,994,607	3,678.0	266.86	224,648	.3
Citrus fruits.....	1,990	.2	do.....	13,162,000	6,614.0	364.25	724,850	.8
Small fruit.....	1,422	.1	do.....	2,742,859	1,923.0	340.89	484,748	.5
Miscellaneous.....	2,422	.2	do.....	19,343,020	7,986.0	288.27	722,426	.8
Total.....	41,464	3.7	do.....	301,322,283	7,267.0	308.13	12,776,510	14.4
Miscellaneous:								
Sugar beets.....	37,964	3.4	Ton.....	357,977	9.4	100.24	3,805,379	4.3
Cotton.....	107,390	9.7	.....	.....	.....	194.54	20,892,328	23.5
Cane.....	5,185	.5	Ton.....	14,738	2.8	27.66	142,880	.2
Other crops.....	14,681	1.3	.....	.....	.....	21.20	316,072	.3
Total.....	165,400	14.9	.....	.....	.....	152.09	25,156,659	28.3
Duplication.....	95,896	8.6	.....	.....	.....	.....	.....	.....
All crops.....	1,113,469	100.0	.....	.....	.....	79.88	88,974,137	100.0

¹ This figure does not represent the average value of pasture for a year or season, as considerable areas pastured were also harvested and are included in the duplicated area.

Openings of project lands.—Several small openings of land on the reclamation projects took place during the year, the most notable being those on March 5 and 13 on the North Platte and Shoshone projects, respectively.

Public resolution No. 29, giving to discharged soldiers, sailors, and marines a preference right of homestead entry, was approved on February 14, 1920, and by order of the Secretary of the Interior the provisions of this resolution were made applicable to the above-mentioned openings, although the lands had already been advertised as available for filing by any qualified citizen.

These two openings received especial attention in the press of the country largely because of the proximity of the dates to that of the approval of this resolution, with the result that the Washington office and the two project offices were literally swamped with inquiries from ex-service men concerning the openings.

On the North Platte project a drawing was held for 80 farm units comprising a total irrigable area of 5,079 acres. The number of inquiries answered by the Washington and the project offices amounted to nearly 20,000. The number of water-rental applications, accompanied with the first payment, filed at the project office, totaled 3,298, or approximately 40 per farm unit, and the amount of money deposited by applicants approximated \$1,200,000. The money deposited by applicants unsuccessful in the drawing was returned to them as promptly as possible.

Similar conditions, in lesser degree, obtained at the opening of 57 farms on the Shoshone project on March 13.

The following is a summary of the public land openings on the irrigation projects during the fiscal year:

Project.	Date of opening.	Acreage.	Number of farms.	Farms entered.	Farms unentered.
Shoshone, Wyo.....	Oct. 9, 1919	5,500.0	79	70	9
Newlands, Nev.....	Feb. 26, 1920	1,525.0	24	24	.....
North Platte, Nebr.....	Mar. 5, 1920	5,078.9	80	80	.....
Shoshone, Wyo.....	Mar. 13, 1920	5,500.0	57	57	.....
Grand Valley, Colo.....	Mar. 25, 1920	377.5	10	5	5
Newlands, Nev.....	Mar. 31, 1920	1,929.0	19	10	9
Milk River, Mont.....	Apr. 30, 1920	1,100.0	21	21	.....
Total.....		21,010.4	290	267	23

Since 1918, when former Secretary Lane first urged the development of our vast areas of unused and unproductive land through the establishment of soldier settlements throughout the country, the service has received nearly 175,000 inquiries from ex-service men concerning opportunities on the land, and the conclusion is inevitable that, given the opportunity, thousands of such men would lead in a movement "forward to the land."

Sale of Yuma mesa land.—Under the terms of the act of Congress of January 25, 1917, the mesa lands in the first unit of the Yuma auxiliary project, comprising about 6,400 acres, were offered for sale at public auction on December 10, 1919, and at weekly sales thereafter. Of the 532 farms, 518 had been sold at the end of the fiscal year.

The Secretary of the Interior placed a minimum price of \$25 per acre on the land, and the estimated cost of construction of the project was \$200 per acre. The land sold at an average of \$230 per acre, and of this amount 25 per cent has been paid. The sale price of the land amounted to \$171,340.40, and that of the water right to \$1,212,056, or a total value of \$1,383,396.40.

The land is divided into tracts of 5 to 20 acres each, which will be devoted to the growth of citrus fruits, figs, dates, grapes, olives, and gardens. The weather records show that the lands are practically frostless, and crops can be grown the year round.

Construction of the first unit of the project was authorized by the Secretary on June 8, 1920.

No new projects undertaken.—Lack of funds, resulting from the progressive decline in the receipts from the sale of public land, combined with the comparatively small returns from construction repayments resulting from the law providing for repayment in 20 years and the necessity of setting aside \$1,000,000 per year to repay advances from the "bond loan," provided in the act of 1910, has definitely precluded the undertaking of new projects. Only comparatively small areas of new land on the projects have been brought under irrigation by extending existing canals and laterals. The prospects are bright, however, for increased funds for reclamation.

Under the provisions of the act of February 25, 1920, for leasing lands containing coal, oil, etc., it is expected that several million dollars will be transferred to the reclamation fund before many months, and that a like sum will be added to the fund annually for an indefinite period. Section 35 of the act provides in part—

That 10 per cent of all money received from sales, bonuses, royalties, and rentals under the provisions of this act, excepting those from Alaska, shall be paid into the Treasury of the United States and credited to miscellaneous receipts; for the past production 70 per cent, and for future production 52½ per cent of the amounts derived from such bonuses, royalties, and rentals shall be paid into, reserved, and appropriated as a part of the reclamation fund created by the act of Congress, known as the reclamation act, approved June 17, 1902.

At the present time, however, no definite statement can be made of the amounts which eventually may be available.

Reconstruction measures.—There is an obvious need of adopting wise policies of reconstruction on the land, as in other departments of national life. The need is not merely for more land in cultivation, including the rehabilitation of districts from which the people are turning away, but the deeper need is for new forms of rural life that shall be attractive and satisfying to the masses. In all sections of the United States, including New England and the South, public sentiment has developed in favor of a policy of reclamation in its broadest sense, with the result that a work of education, creative in itself, has been accomplished both in and out of Congress. What is of equal importance, concrete measures have been put before the country and carried far toward actual enactment. Among these may be mentioned the following:

H. R. 14157, the measure popularly known as the Lane-Mondell soldier-settlement bill, passed the House of Representatives as Title VI of the so-called bonus bill, and is now pending before the Senate. This measure would permit the development by the Federal Government of cooperative community soldier settlements in practically every State, the cost of the land and of construction to be paid for

by soldier settlers in small amounts over a long period of years at a low rate of interest.

S. 4372, known as the Borah bill, also designed for the benefit of ex-service men, was favorably reported by the Senate Committee on Public Lands and is now on the Senate calendar.

S. 3477, known as the Smoot rural homes bill, passed the Senate in April, received a unanimously favorable report from the Committee on Irrigation of Arid Lands of the House of Representatives, and stands high on the House Calendar. The purpose of this bill is to increase, without expenditure of Federal funds, the opportunities of the people to acquire rural homes. As stated in the report of the House committee—

the initiative for development under this plan must be taken by landowners or local communities. They will apply to the Secretary of the Interior and ask him to use the engineering facilities of the Reclamation Service to investigate a proposed project, accompanying their application with the estimated cost of such investigation. If their project is approved as sound and feasible from an engineering, economic, and agricultural standpoint, the Secretary enters into a contract with the landowners under which he agrees to organize and develop the project as is now done under the reclamation law, with the important difference that the project is constructed wholly at the expense of the landowners.

The enactment of this measure should result in the development and settlement of large areas of at present unproductive land held in private ownership, the cultivation of which would add enormously to the economic well-being of the Nation.

Foreign Government representatives visit projects.—Practically since the inception of the work of reclamation by the Federal Government, progress in the construction and operation of the projects has been watched with ever-increasing interest by foreign Governments, and every facility has been given their representatives for study and observation of the various problems connected with reclamation.

Irrigation development of hitherto largely unused lands is becoming more and more prominent in Australia, South Africa, Canada, Brazil, Argentine, Russia, and other countries, and the works of the Reclamation Service have for many years attracted engineers and economists from all over the world. There can be no doubt that much of the stimulus for extended reclamation development of the arid regions of the world has been the direct result of first-hand study of the irrigation problem in the United States, and particularly that as exemplified by the work of the Federal Government.

Notable among representatives of foreign Governments visiting the projects during the fiscal year were Hon. Boris Bakhmeteff, the Russian ambassador; Dr. Flavio T. Ribeiro de Castro, assistant to the

Federal inspector of roads of Brazil; Mr. Vincente Mills, chief supervising surveyor of the bureau of lands, Philippine Islands; Mr. T. E. Scaife, circle engineer, irrigation department, Capetown, South Africa; and Mr. Ake Alin, civil engineer of the Royal Swedish board of water falls, Stockholm, Sweden.

Congressional inspection of projects.—In order to appropriate money intelligently for the development of reclamation, personal knowledge of the needs of the projects is almost essential. The service has always welcomed the most minute inspection of its projects on the part of all interested persons, and especially on the part of those committees of Congress to whom is confided the duty of considering bills affecting the work of the service. A number of inspection trips have been made by congressional committees during the life of the service, and one of the most important was under way during the closing days of the fiscal year.

On June 20 a number of members of the Committee on Appropriations of the House of Representatives, headed by Hon. James W. Good, of Iowa, chairman, and accompanied by Representative N. J. Sinnott, chairman of the House Committee on Public Lands, and representatives of the Reclamation Service and the National Park Service, left Chicago for an extended trip of inspection over a large number of the reclamation projects and several of the national parks.

It is believed that the first-hand knowledge gained by these Members of Congress of the needs of reclamation expansion can not fail to bear fruit beneficial to the reclamation projects.

Finances.—The financial condition of the service may be summed up in the following condensed statement of total receipts and expenditures:

The statement of cash receipts and payments shows that at the beginning of the fiscal year there was \$1,008,174.85 cash on hand. During the year this amount was augmented by receipts amounting to \$7,607,597.16. Cash expenditures during the fiscal year were \$5,792,695.91.

The balance on hand at the close of the fiscal year amounted to \$2,823,076.10. Of this amount, however, \$1,000,000 was reserved to repay the first installment on the loan authorized by act of June 25, 1910 (36 Stat., 835), amended by act of June 12, 1917 (40 Stat., 149).

In accordance with the practice which has been followed for nearly two years past, the General Land Office makes monthly statements of the amounts received from the sale of public lands and fees and commissions, from which the reclamation fund is derived, and 80 per cent of the total of this statement is immediately transferred to the credit of the reclamation fund, thus making these receipts available without waiting for the final audit of receivers' accounts. Under this plan

the amounts held in the division of public moneys, pending audit, are reduced to an amount which it is estimated will be more than sufficient to cover repayments for lands erroneously sold and the 5 per cent State funds excepted by the act of June 17, 1902. Upon completion of audit, which is usually from six to nine months after the collection, the balance due the reclamation fund is made available.

The reclamation fund has received from the sale of public lands a total of \$100,078,475.68, from the sale of town lots \$493,329.63, and \$20,000,000 advanced by act of June 25, 1910 (36 Stat., 835). Under the provisions of the reclamation act this is made a revolving fund, so that the return of any portion of the investment is made available for reinvestment in other operations. The reclamation fund, therefore, can be compared with capital invested in any business in commercial enterprises, and this authority to so use the funds makes possible the construction of works aggregating a cost greater than the amount of the original investment. To date the gross disbursements from the reclamation fund total \$150,612,787.22, and in addition to this amount equipment, supplies, and services amounting to \$7,756,138.69 have been transferred between projects, making a total of \$158,368,925.91. The net investment in the projects to June 30, 1920, was \$117,748,729.21. All appropriations by Congress for reclamation-fund projects are in effect authorities for using the reclamation fund, as the acts have specifically provided that the amount to be expended for the service as a whole is limited to the available amount in the reclamation fund. It follows that the construction of new works depends upon the repayment of the cost by the projects or units of projects which have been completed, as but little is being added to the fund from original sources.

In all, 26 projects have been approved for construction, and on 19 of these public notices have been issued announcing the construction charges to be repaid by all or a portion of the area. Projects are sometimes opened by units, and while construction is proceeding on uncompleted units repayments are being made on those which are completed.

The reclamation-extension act extended the time of repaying the cost of the works to a maximum of 20 years, in graduated payments, so the rate of turnover of capital is low, and without an increase in capital the progress of construction will be slow. Relief may, however, be expected from the receipts on account of the act of February 25, 1920 (Public 146) known as the oil and coal leasing act, which provides that a certain percentage of these receipts shall be credited to the reclamation fund. It is too early, however, to anticipate the amount of such revenues.

BUREAU OF MINES.

Under the organic act (37 Stat., 681) establishing the Bureau of Mines, the bureau was authorized to conduct investigations to improve health and safety in the mineral industry and to promote efficient development and utilization of mineral resources. The field of the bureau's activity, therefore, extends from the commercial development of mineral deposits to the production and utilization of marketable products.

During the past fiscal year the bureau has given special attention to aiding the mineral industries in the transition from war to the normal activities of peace. Many industries whose volume of business increased enormously during the war, or which had been established to supply commodities needed for military use, or to replace imports cut off by the war, found themselves in a precarious condition. The bureau has sought to indicate ways and means for producers of minerals and mineral products to establish themselves on a safe business basis, in order to be able to meet renewed competition from foreign sources, and the changed conditions of supply and demand.

The bureau has conducted special investigations relating to new methods of producing various mineral substances and has gathered and disseminated information in regard to sources of supply of economic minerals. It has continued to study mine hazards, rescue and first-aid training for miners, health and safety conditions in mines and mining communities, explosives and equipment used in mines, the utilization of coal with greater efficiency, the prevention of waste in the production, transportation, and use of petroleum and natural gas, and the development of processes whereby deposits of minerals now unworked may be made available as sources of supply. In the course of its work the bureau has cooperated with the War Department, Navy Department, the Department of Agriculture, the Emergency Fleet Corporation, the Bureau of Standards, the United States Public Health Service, with the other bureaus of the Department of the Interior, and with various State and private organizations. The more important accomplishments of the year are briefly mentioned in the following paragraphs.

Cooperative agreements.—In its endeavor to secure the most effective action with State agencies seeking the improvement of efficiency and the lessening of accidents in the mineral industries, the Bureau of Mines, with the approval of the Secretary of the Interior, has made cooperative agreements with State organizations and with State universities and mining schools.

In the past fiscal year investigations as outlined below were conducted under the terms of cooperative agreements with the State

universities, mining schools, and State commissions, as follows: University of Arizona, Tucson, Ariz.; Industrial Accident Commission of California; University of California, Berkeley, Calif.; University of Idaho, Moscow, Idaho, and Idaho Bureau of Mines and Geology; Colorado School of Mines, Golden, Colo.; Engineering experiment station of the University of Illinois, Urbana, Ill., and Illinois Geological Survey; University of Minnesota, Minneapolis, Minn.; New York Bridge and Tunnel Commission, and the New Jersey Interstate Bridge and Tunnel Commission; Ohio State University, Columbus, Ohio; the State of Oklahoma; Oregon Bureau of Mines and Geology; Industrial Commission of the State of Utah; State School of Mines of the University of Utah, Salt Lake City, Utah; University of Washington, Seattle, Wash.

Mine experiment and mine safety stations.—The bureau has 11 mining experiment stations, 9 mine safety cars, and 7 mine safety stations. The mining experiment stations are investigating mining and metallurgical problems; the mine safety stations are instructing miners in first-aid and rescue methods, and in giving assistance after mine disasters. The mining experiment stations are at Pittsburgh, Pa.; Columbus, Ohio; Urbana, Ill.; Minneapolis, Minn.; Bartlesville, Okla.; Salt Lake City, Utah; Golden, Colo.; Tucson, Ariz.; Berkeley, Calif.; Seattle, Wash.; and Fairbanks, Alaska.

The mine rescue or mine safety stations are situated at Pittsburgh, Pa.; Vincennes, Ind.; Norton, Va.; Jellico, Tenn.; Birmingham, Ala.; McAlester, Okla.; and Seattle, Wash. The mine-safety cars have headquarters at Pittsburgh, Pa.; Huntington, W. Va.; Ironwood, Mich.; Terre Haute, Ind.; Pittsburg, Kans.; Butte, Mont.; Raton, N. Mex.; Rock Springs, Wyo.; and Reno, Nev. The bureau also maintains four motor rescue trucks—one at Pittsburgh, Pa., one at Birmingham, Ala., one at Vincennes, Ind., and one at Seattle, Wash.

Under the terms of the act of Congress approved March 3, 1915 (40 Stat., 969), appropriation was made in the sundry civil bill approved June 5, 1920, for the establishment of two new mining experiment stations, to be under the direction of the Bureau of Mines. One of these stations will be located in the Birmingham, Ala., district, and the other will serve the St. Louis, Mo., district.

Mine-rescue and first-aid training.—The 10 mine-rescue cars of the Bureau of Mines were busy during the entire year in training miners in mine rescue and first aid. The epidemic of influenza curtailed the work during the months of February and March, 1920, but the surgeons and crews of the various cars offered their services to the public and the hospitals in the vicinities of their headquarters and did much work in assisting the sick. Training work was also conducted by the nine safety stations and six rescue trucks of the

bureau. A total of 8,993 men completed courses in first-aid training and received qualified certificates; 1,184 men were given additional training. During the year a total of 28,586 persons visited the mine-safety cars and stations, and 40,516 attended the lectures given by the crews of the mine-rescue cars and stations. Early in the fiscal year the mine-rescue cars of the Bureau of Mines gave demonstrations in first-aid and mine-rescue work at the Wisconsin, Kansas, and Illinois State fairs. On request, mine-rescue apparatus owned by mining companies was inspected and advice given as to its condition and the repairs needed.

During the year assistance was rendered by the division of safety cars and stations at 27 mine accidents, 17 at coal mines and 10 at metal mines. Arrangements have been effected with the Air Service to begin cooperation with the Bureau of Mines safety stations in furnishing planes to carry safety engineers and assistants with rescue apparatus to mine disasters.

Mining statistics.—As a basis for work in lessening the accident rate in the mineral industries the Bureau of Mines is compiling and publishing information on the occupational hazards in those industries and is giving especial attention to fatal and nonfatal injuries in quarries, metal mines, and metallurgical plants. The statistical reports on coal-mine fatalities appear monthly; those on metal-mine, quarry, and coke-oven accidents and on accidents at metallurgical plants are issued annually. The data on accidents in metal-mines, quarries, coke-ovens, and metallurgical plants, except blast-furnace plants, are furnished voluntarily by the operators, as the United States, unlike other great mining countries, has no law requiring operators to report mine accidents to the National Government.

Safety and health of miners and sanitary conditions at mines.—On account of their importance to the health and safety of miners, most of the bureau's mining engineers and surgeons in the West have concentrated attention on the problems of dust and ventilation in metal mines; and investigations will be conducted in the principal mining camps of the West on ventilation, the relation of rock dust to pulmonary diseases, and the effect of high temperatures and humidity on the health of miners. The bureau is endeavoring to prevent accidents by distributing to individual miners illustrated circulars on dangerous and safe mining practices and printed instructions regarding safety in mines; the causes and prevention of mine fires; and the testing and standardizing of electric motors and apparatus for use in different types of mines. The bureau also takes, exhibits, and distributes for exhibition films showing underground and surface mining conditions, and is supplying, with the cooperation of other agencies, pictures of general interest to the mining public.

Research at war-devastated areas.—Under the strain of war, mining and metallurgy in Europe made notable developments, and the post-war reconstruction attendant on the destruction of the collieries and the steel and iron plants in the war zone of France presented problems of unusual magnitude and complexity. The Secretary of the Interior sent to France to investigate such developments and methods of rehabilitation a commission comprising Dr. F. G. Cottrell, then chief metallurgist of the Bureau of Mines; Frank H. Probert, dean of the University of California mining school; and George S. Rice, chief mining engineer of the Bureau of Mines. Mr. Rice, as a part of his investigation, journeyed to the Saar Basin, and visited mining districts in central and southern France, in Belgium, and in Great Britain. He observed particularly the iron and coal situation in Europe as a result of the war, and studied European methods of mining coal, iron, and potash. He investigated also the possible industrial application in the United States of the liquid-oxygen explosives used by the Germans. In Paris he served in an advisory capacity to the economic section of the American Peace Commission. During the current fiscal year Mr. Rice has prepared reports upon the results of his investigations and observations.

Application of the geophone in mining.—A number of experiments were made at the experimental mine, near Bruceton, Pa., on the use and limitations of the geophone, a listening device developed during the war. Mechanical improvements were effected tending to increase the value of the geophone for use in locating a point underground. This instrument, no doubt, will prove of value for locating entombed miners after a disaster, locating subterranean fires, etc., and in running mine drifts and tunnels. The geophone has been successfully used by the Bureau of Mines in locating mine fires, leaks in water mains, etc.

War minerals relief commission.—Section 5 of the act of March 2, 1919 (40 Stat., 1272), authorizes the Secretary of the Interior to adjust certain losses sustained in the production, or attempted production, of manganese, chrome, pyrites, or tungsten during the period of the war. For execution of this section a commission was appointed by the Secretary of the Interior to review claims and to make recommendations to the Secretary, in whom final action is vested.

During the fiscal year 1920 the war minerals relief commission considered and made recommendations in 904 of the 1,203 claims filed. In 108 of these claims awards were made amounting in the aggregate to \$1,333,554.13. During this period 17 engineers and 13 auditors were in the field, engaged in the examination of properties and accounts involved in the claims.

Regulation of explosives.—On July 19, 1919, all restrictions regarding explosives which had been imposed under the explosives-

regulation act (approved Oct. 6, 1917; amended July 19, 1919) were removed, with the exception of the licensing requirements for the manufacturing, exporting, and importing of explosives. These classes of licenses are still required, and will continue to be, until peace is declared or the law is repealed.

Recovery and storage of helium.—Experimental development of the helium plant at Petrolia, Tex., was continued throughout the year by the Bureau of Mines with funds from, and in cooperation with, the Air Services of the Navy and Army. The project is under the general administrative control of the Army and Navy Helium Board.

Funds have been supplied in equal proportions from Army and Navy appropriations for the establishment of a cryogenic research laboratory for the investigation of properties of gases and liquids at low temperatures, with particular reference to the separation of helium from natural gas. The equipment for this laboratory is being assembled.

Calculations were made and estimates submitted by the chief mining engineer to the Army and Navy Air Services on the cost of storing helium in mines. Comparison made with estimates and actual figures of costs in connection with other methods of storage indicated that this is probably the cheapest and most permanent method. On an allotment by the respective air services, experiments were conducted at the bureau's experimental mine near Bruceton, Pa., and field investigations were made of the suitability of coal, metal, and salt mines for the storage of helium. The allotment expired on June 30 and it is probable that further investigations will be necessary in order to yield definite results.

Government fuel yards.—Conditions in the District of Columbia during the fuel shortage of 1917-1918 showed the advantage of a centralized purchasing and distributing organization to supply Federal needs of coal and proved an unanswerable argument for establishing a yard which could carry in reserve quantities of coal for Federal and municipal plants. In 1918 Congress made appropriations for the establishment and for the maintenance of fuel yards in the District of Columbia. During the fiscal year ending June 30, 1919, 247,540 tons of fuel were purchased.

The installation of a permanent yard begun in the winter of 1918-1919 was not completed until early in the present fiscal year. As early as May 1, 1919, however, steps were taken to fill the storage spaces in the Federal and municipal buildings, so that on November 1, when the bituminous miners' strike became effective, there was on hand a supply of approximately 38,000 tons in the yard and in consumers' bins. The receipts of coal were so reduced that some of the Government plants would have been without fuel but for the reserve

at the yard. This reserve coal was drawn upon in the months of November and December and was practically exhausted by the 1st of January. At that time coal was difficult to obtain, but enough was procured to meet the daily requirements of 1,400 to 1,500 tons. The consumption in March decreased somewhat, but shipments were held at the same rate as in the months of January and February, so that a new storage reserve in the yard of about 7,000 tons was accumulated by the 1st day of April, when coal contracts expired. Without this storage reserve the coal situation would have been most critical in April, May, and June on account of sporadic strikes culminating in the breakdown of transportation and a shortage of fuel, a condition that has prevailed more or less acutely to the end of the fiscal year.

During the year 266,942 tons of coal, 689 cords of wood, 1,122 bushels of charcoal, and 22 tons of coke were handled. All but 73,463 tons were delivered by truck, at an average handling cost of \$1.138 per ton. A fleet of 33 trucks were employed, and the overhauling of these has been done at the yard's own garage.

The Government fuel yards performed a real and tangible service in meeting under trying conditions the coal requirements of the Government. A material saving in money to the Government has also resulted.

Increasing efficiency and lessening waste in the petroleum and natural-gas industries.—During the fiscal year the Bureau of Mines, by cooperating in the work of the presidential committee in its standardization and revision of petroleum specifications, has assisted in increasing the output of gasoline by many millions of gallons. As a result, refineries are enabled to cut deeper into the crude oils. The revised specifications have been adopted as a standard by several States. The bureau has investigated the quality of gasoline sold throughout the United States by a series of surveys, and plans to conduct such surveys twice yearly.

Engineers of the bureau assisted in the preparation of operating regulations for oil and gas leases under the new leasing act (Stat. of Feb. 25, 1920). These regulations are intended to protect the public against waste and damage in the drilling and operation of oil and gas wells on lands leased by the Government.

Significant work has been accomplished in arousing the public to the immediate need for guarding the remaining supply of natural gas, the bureau working in cooperation with the national committee on natural-gas conservation appointed by the Secretary of the Interior. Toward the end of the fiscal year a conference in Washington of representatives of governors of States using natural gas and of representatives from State utilities commissions indorsed the committee's resolutions which are to be presented to several legislatures. In order to stimulate efforts for conserving natural gas in the home, a woman

specialist of the petroleum division has carried expert information on the economical use of natural gas and gas-using appliances, by lectures and demonstrations, to women's clubs, home economic associations, and in some cases to the domestic-science sections of public schools.

Methods for recovering a greater percentage of the oil contained in underground sands are being studied. Investigations and recommendations for preventing waste in drilling wells in the Monroe gas field, La., have been made at the request of the operators.

In cooperation with the Rocky Mountain Petroleum Association, the Bureau of Mines has applied measures of conservation in the Wyoming and other Rocky Mountain fields; its engineers and expert drillers investigated waste of oil and gas and directed the repair of many oil wells; the savings effected by the repair work performed by the bureau's engineers in one Wyoming well alone repaid the cost of the entire work for a year. The bureau's investigations have disclosed enormous losses from evaporation of oil in storage and transportation, and have indicated methods of prevention. Further investigations are being made. Experiments in the past year have disclosed methods of increasing the yield of motor fuel greatly by the cracking of heavy oils and tars to obtain gasoline and low-viscosity fuel oil.

Oil shale.—Much laboratory investigation of oil shale has been carried on and methods of testing have been standardized. An experimental oil-shale retort has been installed at Boulder, Colo., where tests have begun. Two cooperative funds of \$10,000 each have been placed at the disposal of the Bureau of Mines, one from the State of Utah, and one from the State of Colorado. Cooperative oil-shale work was carried on also with the Southern Pacific Co. at Elko, Nev., where a retort of the Pumpherstons type was erected and several preliminary runs made.

Administration of the Bureau of Mines.—In the early part of the fiscal year a general reorganization of the bureau was made because of the increasing magnitude of its work, the many changes following the war, and the need of closer coordination of the work of the experiment stations and that of the various divisions. As a result, the investigative work is now separated as much as possible from work of a purely business or administrative nature.

The investigations branch, which is under charge of the assistant director, consists of the technical divisions and the division of mining experiment stations. The technical divisions include the division of mineral technology, fuels division, mining division, and division of petroleum and natural gas. Throughout the year these divisions continued to conduct research in their respective fields and to assign problems for investigation at the various mining experi-

ment stations. The experiment stations are under the direction of the supervisor of stations and the assistant supervisor. The supervisor has charge of the administrative work of the stations and the coordination of work on problems assigned by the chiefs of the technical divisions, thus preventing duplication of effort and advancing the various problems harmoniously in accordance with a well-designed plan.

The operations branch, which is in charge of the assistant to the director, includes the division of office administration, the division of education and information, the Government fuel yards, the division of mine-rescue cars and stations, and the division of explosives. Matters of routine office administration are in the immediate charge of the chief clerk; the other divisions are each in charge of an engineer.

During the fiscal year the mining division conducted numerous investigations in the furtherance of efficiency and safety in both coal mining and metal mining, as well as special investigations on the application of military explosives to industrial use, and the standardization of coals for export. The division prepared regulations for leasing Government coal lands; and studied, in cooperation with the Interior Department Commission, methods of mining coal, iron, and potash in France, Belgium, and England, and of methods of rehabilitation of devastated mines. The fuels division made special investigations on the utilization of lignite and coke as fuels, the increase of efficiency in the use of fuels for domestic and industrial purposes, and the improvement of mechanical and electrical equipment for mines. The division of mineral technology continued investigations on alloy steels, on the rare metals and on radium and radioactive substances. The mineral technology work, which during the war was transferred to the war minerals division, has reverted to the division of mineral technology. The metallurgical division conducted many investigations bearing on the increase of efficiency and the elimination of waste in the treatment of ores. The petroleum division carried on work relating to the conservation of natural gas in industrial and domestic use; to the protection of oil and gas sands in various fields; and to efficiency in production, distribution, and use of petroleum.

Bartlesville experiment station.—At the Bartlesville station which is devoted to the problems of the petroleum and natural-gas industries, the work included investigations of underground conditions in oil fields; producers were advised and assisted in meeting difficulties in drilling and developing wells; research done by the station included investigation of losses of oil in storage and in transportation; tests to ascertain the proportion of gasoline not extracted in the treatment of natural gas for gasoline recovery; an investigation of the manufacture of carbon black; a study of recovering gasoline from

still vapors at refineries; an investigation in the refining of crudes with regard to possible improvements in refinery practice, and an investigation of the use of fractionating towers as a means of increasing the yield and quality of gasoline and other light oils.

Berkeley experiment station.—During the fiscal year the station continued to assist the war minerals relief commission in field investigations in California; conducted experiments on the treatment of quicksilver ore; continued an investigation of the chemistry of volatilization of metallic compounds in conjunction with the work of the Salt Lake City station on the recovery of metals from ores by volatilization; and completed an investigation of the production of potash at Searles Lake.

Columbus experiment station.—The Columbus station, at the University of Ohio, investigated the crucible-making properties of American and foreign graphites; the physical properties and pottery-making values of American kaolins as compared with the best English kaolins; the properties of dolomite-magnesite mixtures with a view to the possible substitution of domestic dolomite for foreign magnesite; method of treating fine clays of the State of Ohio with greater efficiency; and the durability of different fire brick.

Fairbanks experiment station.—The Fairbanks, Alaska, station investigated the steaming value for boiler fuel of Alaska lignite and spruce wood, and resistance of lignite to weathering, with a view to providing cheaper fuel for the mining industry of Alaska. The station also developed a satisfactory method of recovering gold from heavy sands remaining in sluice boxes after clean-ups, and conducted concentration tests of gold ores.

Golden experiment station.—The main work of the Golden station continues to be on the rare metals. The research of the year on radium included experiments on the chemical effects of radium emanation in gas reactions; work on redetermining the spectrum of the radium emanation, on the redetermination of the radium-uranium ratio, on the properties of radium luminous paint, which resulted in a standardization of photometers for luminosity measurement, and on the action of radium emanation on nonluminous pure zinc sulphide. The station studied also the recovery of vanadium from carnotite tailings, and the commercial treatment of zinc descloizite, and methods of extracting vanadium. The station's investigations included cooperative work on treatment of molybdenum steels and successful experiments on the recovery of molybdenite from molybdenite-chalcopryrite ores by flotation. Methods of sulphatizing roasting of nickel sulphide were studied for the purpose of supplementing inadequate domestic supplies of nickel ore. With the State of Colorado, which appropriated \$15,000 for the work, a cooperative investigation on the treatment of complex ores has begun.

Minneapolis experiment station.—At the Minneapolis station smelting tests of low-grade manganese ores are being made with an experimental blast furnace; tests of the efficiency of different fuels in domestic heating apparatus have been conducted, and the work of the station during the fiscal year included investigations on phosphorus in iron ores.

Pittsburgh experiment station.—The work of the largest of the Bureau of Mines experiment stations includes both mining and chemical research. The work on mining comprised work on safer electrical appliances for mines, and of detectors for determining the carbon dioxide content of mine air; tests on the explosibility of coal dusts, and investigations to determine the cause of explosions in mines, railway, and munition plants; tests of explosives to determine their permissibility for use in gaseous or dusty coal mines, resulting in the addition of 34 and the removal of 17 explosives for the permissible list; research to determine the adaptability to commercial use of T N T and other explosives being disposed of by the War Department; cooperative work with the National Research Council on the production of Neumann bands in steel, and with a munition plant on the effects of temperature on the crystallization of ammonium nitrate. From his headquarters at Pittsburgh the mine-safety engineer supervises the safety stations and rescue cars.

The work of the fuels section comprised investigations to increase efficiency in the use of fuels in steam boilers and furnaces, of powdered coal in furnaces, of fuel in refining oils, of coke in heating houses, and of gas in metallurgical furnaces. Cooperative research was conducted with the United States Shipping Board in tests of oil burners, and with the United States Army in tests of equipment for house heating.

The chemical research of the station included the development of a method for analyzing graphite; tests of the fusibility of the ash of coals; analyses of aluminum; routine analyses of mine gases, explosives, gases from coal and coke, of fuel gases, or exhaust gas from motor vehicles in relation to vehicular tunnels; chlorination of natural gas as a possible way of producing carbon tetrachloride, chloroform, and methyl chloride; the development of a colorimetric method to detect oxides of nitrogen in mine air. Investigations have been completed on causes of corrosion of rifles and means of prevention; on the use of gas masks in railway tunnels in fighting fires, and on gases produced by carbon-tetrachloride fire extinguishers; and on the permeability of oxygen-breathing apparatus to gasoline vapors. A portable indicator for detecting hydrogen cyanide in air, for use in fumigation work and at cyanide plants, was designed.

The work of the petroleum laboratory at the Pittsburgh station covered routine analyses of oils and greases; design and development

of apparatus and methods for analysis of petroleum; research on cracking petroleum; collection and analysis of samples of gasoline sold in 1920; and development of a method for removing water from emulsified crude oils.

Salt Lake City experiment station.—The Salt Lake City station of the bureau, in cooperation with the metallurgical research department of the Utah School of Mines, continued investigations of the treatment of low-grade and complex ores by volatilization and other methods, and the obtaining of petroleum from oil shales. The work has included the testing of a large number of ores by volatilization; recovery of potash from low-grade alunite; concentration and flotation of molybdenum and quicksilver ores; and, in cooperation with the State of Utah and with Salt Lake City, investigated the abatement of smoke in Salt Lake City.

Seattle experiment station.—The station at Seattle conducted investigations in cooperation with the University of Washington, on mining and utilizing western coals, chemical problems of flotation, electrometallurgical treatment of low-grade ores, ceramic tests of clays and the treatment of the low-grade ores of the Northwest. The coal investigations included mining methods in the State of Washington; standardized float and sink tests for coal-washing equipment; Alaskan coal mining methods; and storage and distribution of powdered coal. Installation of electrometallurgical equipment, delayed for several years by the war, was completed, and research progressed on the problem of power and raw materials for the electrochemical and electrometallurgical industries in the Northwest. In cooperation with the ceramic department of the University of Washington and the State Geological Survey, the station conducted an investigation of the clays of the State, and in cooperation with the Idaho State Bureau of Mines and Geology investigated clays from Idaho.

Tucson experiment station.—During the fiscal year the leaching plant at the Tucson station was moved into new quarters, and was remodeled and improved. The principal work of the station continued to be the leaching of copper ores. Investigations of sulphuric acid and sulphurous acid leaching were made in cooperation with copper companies of the State.

Urbana experiment station.—The investigations of the year conducted in cooperation with the mining department of the University of Illinois comprised coal-washery practice with the purpose of minimizing washing losses and rendering the coal more suitable for coking; the occurrence and distribution of organic sulphur in coal; the use of middle western coal as generator fuel in the manufacture of water gas; distillation products of coal tar from gas plants; and the continuation of a study of surface subsidence over coal mines.

Ithaca office.—The Ithaca field office worked principally on two problems, the preparation of special alloy steels in cooperation with the United States Navy and the collection of data on electric brass furnaces.

Dallas office.—The increasing amount of work done by the bureau in the oil fields of Texas resulted in the establishment of a field office at Dallas. Investigations centering in this office comprise studies of operating conditions in northern Texas with respect to the geology of oil sands, location of oil zones passed in drilling, remedying of water troubles, and general increased efficiency in production. The office has worked in cooperation with the receiver appointed by the Supreme Court for litigated oil lands on the Texas-Oklahoma boundary.

San Francisco office.—The office in San Francisco serves as headquarters for engineers of the petroleum division detailed to the western fields. Investigations of the year have included studies to increase efficiency of drilling oil wells, to eliminate losses of oil by evaporation while in storage, and to increase utilization of heavy crude oils by improved methods of cracking.

Moscow office.—The work of the year related chiefly to the use of flotation for concentrating lead-silver and other ores.

THE NATIONAL PARK SERVICE.

The outstanding feature of the year's achievements in the national park field is the fact that, while trying economic conditions throughout the country, inflated valuations, increased prices of labor and materials have caused disturbances in every line of human activity and contributed to the general unrest of the masses, the people have enthusiastically turned to the national parks for health, happiness, and recreation.

The final returns show that 919,504 tourists visited 17 national parks and that 138,951 tourists visited 11 national monuments. No records are available for the Hawaii National Park, in Hawaiian Islands; or for Mount McKinley National Park, in Alaska, or for the remaining 13 national monuments under our administration. The total travel to the great scenic recreation areas therefore exceeded the million mark. The following table of travel to the parks and monuments during the past five years will furnish a very illuminating comparison:

1916	356,097
1917	488,268
1918	451,661
1919	¹ 811,516
1920	² 1,058,455

¹ Includes travel to 6 national monuments.

² Includes travel to 11 national monuments.

The following table gives an itemized statement of the travel during the present season as distributed among the various parks and monuments:

Hot Springs Reservation.....	*162,850
Yellowstone National Park.....	79,777
Sequoia National Park.....	31,508
Yosemite National Park.....	68,806
General Grant National Park.....	19,661
Mount Rainier National Park.....	56,491
Crater Lake National Park.....	20,135
Wind Cave National Park.....	27,023
Platt National Park.....	*38,000
Sullys Hill National Park.....	9,341
Mesa Verde National Park.....	2,890
Glacier National Park.....	22,449
Rocky Mountain National Park.....	*240,966
Hawaii National Park.....	(⁴)
Lassen Volcanic National Park.....	*2,000
Mount McKinley National Park.....	(⁴)
Grand Canyon National Park.....	67,315
Lafayette National Park.....	*66,500
Zion National Park.....	3,692
Capulin Mountain National Monument.....	*3,200
Casa Grande National Monument.....	7,720
Colorado National Monument.....	*1,200
El Morro National Monument.....	*2,000
Montezuma Castle National Monument.....	*2,500
Muir Woods National Monument.....	*77,577
Navajo National Monument.....	64
Papago Saguaro National Monument.....	*5,000
Petrified Forest National Monument.....	*30,390
Scotts Bluff National Monument.....	*5,000
Tumacacori National Monument.....	*4,300
Total.....	1,058,455

Increased motor travel.—The motor travel to the national parks may be analyzed as follows: In 1917, 54,692 private cars were recorded, in 1918, 53,966, in 1919, 97,721, and this year the total number of cars entering the national parks is 128,074. These figures show an astounding increase in motor travel to the national parks. Train travel has increased on the average at about the same ratio.

It is difficult to determine the proportion of visitors who come by private automobile and who come by train. Exact data on this distribution is kept in several of the parks but in certain parks which are accessible to large centers of population and reached only by motor highway it is impossible to make this segregation. In Yellowstone National Park, which is reached by three large railroad sys-

* Estimated.

⁴ No records.

tems, a very accurate record is kept on each class of travel and the following table shows this distribution :

Year.	Number of motorists.	Number by train.	Total.
1917.....	22,117	13,288	35,400
1918.....	18,249	3,026	21,275
1919.....	40,096	21,275	62,361
1920.....	49,491	30,286	79,777

These statistics show that tourists coming by private automobile represent on the average 65 per cent of the park travel. This percentage probably will hold true for all the parks.

Travel money kept at home.—In the last analysis this travel is really the deciding factor as to whether or not the parks are measuring up to the high standard that has been set for them, and all that is being said about them as the great recreational and pleasure grounds of the American people.

Stimulated by the whole-hearted, enthusiastic support of the press, the impulse to see America first, and the national parks first of all, becomes yearly more pronounced. Public organizations throughout the United States have contributed their unstinted support to the movement. Throughout the East the great importance of keeping our travel money at home has been recognized. Beyond the Mississippi the fact that the parks are the great loadstones of the West has been fully acknowledged. They attract visitors as do nothing else. People of all classes and means arrive. Every visitor is a potential settler, a possible investor, a booster for the industrial development of the country.

Travel handled better.—While last year considerable congestion was caused at times in some of the parks by the holding of large conventions at the height of the tourist season, careful planning of reservations in advance for such conventions when they would not interfere with the peak load of park travel resulted in avoiding congestion.

Extension of hotel and camp facilities contributed toward this relief.

The demand for accommodations in the parks, however, in general, were so heavy that existing facilities were taxed to the utmost and many of the tourist agencies had to discontinue the booking of large party trips. The extensive additional hotel and camp development planned for the immediate future, however, will undoubtedly enable the operators to accommodate every comer without inconvenience to anyone. Already some of the parks are beehives of industry in the extension of hotel and camping facilities. All of this work has to be done, however, before the snow is on the ground and after it has

left the ground, which means that the working season in such parks as the Glacier, Yellowstone, Yosemite, Mount Rainier, and Crater Lake is very short and ceases with the tourist season.

Escorted tours prove popular.—In former years a few large parties toured the national parks, constituting an unusual feature of the season's travel; this year these prearranged tours were features of the season. They proved very popular. All of the large tourist agencies offer these escorted tours, the railroads entered the field, and many other organizations conducted them for their members. The Brooklyn Daily Eagle newspaper repeated its last year's tour of the national parks, taking in the Grand Canyon, and the Yosemite, and Casa Grande, Petrified Forest, and Muir Woods National Monuments. Twenty Yellowstone-Rocky Mountain National Park tours were run by the Chicago & North Western Railway and Union Pacific system, handling 1,750 passengers; 2,500 could have been handled if sufficient stage and hotel accommodations had been available. The Travel Club of America and the Massachusetts Forestry Association also conducted several tours of the national parks, the former from New York City and the latter from Boston. These are only a few of escorted tours undertaken during the year.

One particularly interesting feature of national park travel is the attention given to it by the boy scout and the girl scout movement. Among the large numbers of boy scouts that visited the parks, 85 scouts from Ogden, Utah, made a 14-day hike through the Yellowstone, and 217 boy scouts from Salt Lake City spent 2 days in Zion National Park. Twelve boy scouts from Ottumwa, Iowa, and 22 scouts from Logan, Utah, also visited the Yellowstone. To encourage the boy scout movement from the East the Far Western Travelers Association, of New York, sent 5 boy scouts, one from each borough of New York City, with a competent scout master, through all of the larger parks of the West, covering in all five parks in 35 days. This is excellent education for these young Americans, and the plan should be further developed.

National park-to-park highway established.—In preceding years the immense value of a park-to-park highway connecting the major national parks of the West has been repeatedly emphasized as one of the important accents of the good roads movement in its relation to the national parks. This year saw the establishment and designation of that highway. The undertaking was directly in charge of the National Park-to-Park Highway Association, in cooperation with the American Automobile Association and other western organizations, with the support and sanction of the National Park Service and the Department of the Interior. The actual pathfinding trip began in Denver, Colo., on June 28 and ended there August 20; the official tour followed the route blazed on the pathfinding trip, starting in Denver

on August 26 and still continuing at this writing. It will end November 9.

The national importance of this highway can not be overestimated, for in extent and grandeur of natural exhibits it surpasses any other scenic drive on earth; 4,700 miles long, it passes through 9 States, crosses every main transcontinental highway, and touches most of the north and south highways west of the Rocky Mountains. It directly connects Rocky Mountain, Yellowstone, Glacier, Mount Rainier, Crater Lake, Lassen Volcanic, Yosemite, Sequoia, General Grant, Grand Canyon, and Mesa Verde National Parks; the heart of the Continental Divide, geysers, glaciers, ice-clad mountain peaks, long dead volcanoes, and our only active volcano in the United States, glacier-carved valleys, mammoth trees, canyons eroded by the action of the elements thousands of feet deep, prehistoric ruins; in fact, a marvelous array of scenic exhibits that can not be touched on one drive anywhere else on earth. The value of this highway as an important factor in the industrial development of the West can not be overestimated. While the highway follows a well-marked, definite route in the form of a great circle, it is but the nucleus of a great interpark road system which will later be developed. Radiations and ramifications from this great circle drive will be the natural concomitants. All of the States already offer exceptional smaller circle tours within the limits of their respective boundaries, which will considerably distribute the interpark travel through their different communities as it passes from one park to the other. This great interpark road system will be rapidly developed now that the national park-to-park highway is designated.

Park road construction necessary.—While the national parks States have entered upon constructive road building programs, giving special attention to the park approach roads, no money has been available for road extensions in the national parks for two years, with the exception of a fund provided in 1919 to complete the rebuilding of the El Portal Road in the Yosemite National Park. Work on the highways under our jurisdiction has been confined by necessity entirely to maintenance and repair, although even here the small funds available have not been sufficient to prevent substantial deterioration. The need of the improvement and the extension of the existing road system in the parks to meet the ever increasing private motor travel is unquestioned. Certain of the heaviest traveled of the park roads should be paved, as this is the only economic means of meeting the constantly increasing maintenance expense. The annual cost of sprinkling and maintaining these roads to a satisfactory standard will provide interest charges, the maintenance charges after being paved, and establish a sinking fund to repay the indebted-

edness in from 20 to 40 years, at the same time adding immeasurably to the enjoyment and comfort of those who use the roads.

There are a number of important new highway construction projects ready to be undertaken within the national parks, all necessary surveys and estimates having been completed and approved. These include such important projects as the beginning of the construction of the transmountain road in Glacier Park to connect the west and east sides of the park, now separated by the highway barrier of the Continental Divide; the widening and reconstruction of the Rim Road at the Grand Canyon, so that it will bear up under the motor transportation recently installed; the construction of the Carbon River Road in Mount Rainier National Park to open up the splendid scenic resources of the north side of that park to the public; and the road to connect the State highway at the border of the Sequoia National Park with Giant Forest. Estimates have been prepared and submitted to Congress to commence the construction of all these road projects.

Trail systems should be extended.—Supplementing the road systems already constructed and proposed for construction, existing trail systems are urgently in need of improvement and new trails should be built in practically all of the national parks in order to enable the horseback and foot tourists to visit the more rugged and less accessible places that it would be impracticable to develop by roads. In fact, in national-park development consideration is always given to what parts of the park could be better served by trail than by road. Trails, when constructed, are so located and built as to give the traveler the best scenery with the least effort, without defacing the topography or detracting from the natural beauty of the country through which it passes. Horseback and foot travel is very popular, and the demands of the past season for this form of recreation has demonstrated conclusively the necessity for more trails. Comprehensive studies are being made, in cooperation between the civil engineering and landscape engineering branches of the Park Service, in planning trails that will properly supplement the road systems and permit their fullest utilization and benefit by the public.

Attempts to commercialize the parks.—Never before in national-park history have so many attempts been made to utilize their lakes, streams, and waterfalls for commercial purposes as during the year just closed. Irrigation interests were particularly insistent in their plans to utilize portions of the Yellowstone National Park for irrigation, and there is not a body of water of any size in that park that is not included in some scheme. The efforts to use the lakes, streams, and waterfalls of all the parks for power purposes, however, had

their primary inception in the unfortunate fact that national park and monument resources were not excepted from the application of the Federal water power act; it is known that power projects thus far contemplate using the Yosemite, Sequoia, and Grand Canyon Parks. These great national scenic areas were set aside for all time for the use, observation, health, and pleasure of the people, and no policy should be firmer fixed than that they must be maintained in absolutely unimpaired form, free from commercial aggression, for all time for the use of future generations as well as those of our own time. Their use for irrigation and power purposes is contrary to the purposes of their establishment and must not be permitted.

Accomplishments of the landscape engineering and civil engineering departments of the Service.—The importance of these two divisions, with their technical and professional advice in the development of the parks along every line, has been ably demonstrated during the past two years. The civil engineering department, engaged principally in planning road and trail extensions and other improvements for the parks, is charged with the formulation of plans for all civil engineering projects and their preparation for final approval by the Service and by Congress. The landscape engineering department passes on all problems affecting the natural conditions in the parks. The demand for expert advice on landscape problems in the parks during the year has been so insistent that it was practically impossible many times for the landscape engineer to give immediate attention and the proper amount of study and thought to many of the problems presented; an assistant was secured to relieve the pressure and expedite the work. It is not an exaggeration to state that nowhere else in the field of landscape engineering is a more varied assortment of problems presented than in the national parks. Not only are there general problems involving forestry, the location of trails, roads, and bridges, and the location and suitability of all structures for the administrative and public utility units in the parks, which are considered in connection with the civil engineering department, but problems in town planning and community development, and housing are presented. While the best of technical training is a necessary qualification, success in both the civil engineering and landscape engineering divisions depends upon a clear and practical understanding and appreciation of the relation of these varied problems to the limitation of existing appropriations. In this work strict conservation is the guiding principle in order that the parks may be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time. With the development of roads and trails and the necessity of increasing facilities for the traveling public the engineering

forces will have to be increased to meet the manifold problems that are constantly arising.

Area of parks and monuments.—The total area of the 19 national parks is now 10,859 square miles or 6,949,760 acres, and the area of the 24 national monuments is now 1,815 square miles or 1,161,600 acres. There is one national park on the Hawaiian Islands and one in Alaska. Two of the monuments are located in Alaska, while the others are located in the United States proper, west of the Mississippi.

Zion Monument becomes Zion Park.—Congress, by act approved November 19, 1919, raised the Zion National Monument to national park status. It is now the Zion National Park. This added 76,800 acres, or 120 square miles, to our National Park system, raising the number of parks to 19. This area is rich in historic associations. The most important scenic feature of the park undoubtedly is Zion Canyon, which bisects it from north to south, 18 miles long, and varying in width from 50 to 120 feet. The early Mormon pioneers chose the Canyon for a refuge and called it Little Zion to distinguish it from Zion, by which names, Salt Lake City was called at that time. The fame of the area has spread and tourist travel to this young park during the past year already has been 3,692 people. Through the cooperation of the Utah Fish and Game Commission a State game preserve has been created bordering north and east of the park. Ruins of ancient cliff dwellings have been discovered in the park, adding further item of interest to the scientific possibilities this reservation offers.

Two national monuments established.—Two national monuments, Scotts Bluff in Nebraska and Yucca House in Colorado, were added to the National Monument system during the year, raising the number from 22 to 24. These monuments are established by presidential proclamation under the American antiquities act.

Special fire-fighting fund should be provided.—I want to dwell with special emphasis on the urgency of providing a special fund to fight forest fires in our national parks. While this year has not carried with it alarming conflagrations in any of the parks, a large number nevertheless started, and park funds had to be used to extinguish them. Last year the fire holocaust in Glacier Park necessitated the expenditure of \$65,000 out of \$85,000 appropriated for that park, throwing the entire park organization out of gear and requiring the diversion of these funds from park purposes, for which they were urgently needed. A contingent fund of \$100,000 for the sole purpose of fighting forest fires, to be touched for no other purpose, would protect the road and trail allotments against depletion at the time the money is most needed and insure the greatest effectiveness in promptly checking the fire hazard.

Gifts to the national park system.—A provision in the last sundry civil act giving me discretionary authority to accept "patented lands, rights of way over patented lands or other lands, buildings, or other property within the various national parks and monuments, and moneys which may be donated for the purposes of the national park and monument system" resulted in a large number of valuable and important donations to the national park system during the year. Perhaps the most important were the remaining tracts of the stands of big trees in the Giant Forest in private ownership. This noblest of all forests now and forever is the property of the people, due to the generosity of public-spirited donors. A gift of \$26,000 enabled the Service to construct a ranger's clubhouse in the Yosemite Valley, while additional funds were given to completely equip the clubhouse after it was finished. One thousand five hundred dollars was given for the construction of a gateway to the Rocky Mountain National park, and over \$1,800 for a public-information building at the Grand Canyon. Notable among the gifts of land were the donation of about 10 acres, containing the Yucca House National Monument and additions to the Muir Woods National Monument and to the Lafayette National Park. These gifts evidence a remarkable interest in our national parks and monuments by public-spirited citizens.

In the field of education.—The shortage of print paper affected the dissemination of information regarding the national parks and monuments, but despite this the national parks have maintained their high place in the educational field. During the year 229,840 national park publications were printed and 154,909 were distributed. The special attention given by far-seeing educators, colleges, and other institutions of learning to the educational possibilities offered by the parks and monuments have been particularly pleasing. Courses on the scenic exhibits of the parks, with special emphasis on the construction of existing formations by the forces of nature, have been installed in several of our important seats of learning. Columbia University last year definitely opened a field of national park study by including that feature in its curriculum. The Iowa State College of Agriculture and Mechanic Arts, in connection with the professional course of landscape architecture, is using the literature of the National Park Service. Colleges have been aided in obtaining complete sets of lantern slides of the national parks to be added to their educational equipment; in fact, too much can not be said in favor of an extensive distribution system of lantern slides, photographs, and films to our colleges and schools. The University of California, through its extension division, conducted a series of lectures dealing with the geology, botany, and folklore of the Yosemite. This "Out-of-doors school" has proven exceedingly popular, the lectures being offered free to the public. The extension division of that

university sought in its presentation only to contribute to the study of nature and to the general enlightenment of scientific subjects relating to the out-of-doors. In the Yosemite also the California State Fish and Game Commission inaugurated a nature guide service, with extremely gratifying results. Close cooperation was given this movement by the various hotel and camping operators, lectures on natural history at the various camps being received with the utmost enthusiasm. Field trips were given twice daily, morning hikes for adults and those in the afternoon for the children; 1,082 adults and 299 children were taken out on these trips during the season, but those in charge were never able to meet the demand. The lectures and informal camp-fire talks were attended by 25,752 persons and covered 37 subjects. This nature guide plan is designed to meet the great insistent demand for information regarding outdoor life, and the movement will grow. Various States are already taking it up.

Archæological investigations.—In the field of archæology the National Park Service was also able to afford considerable assistance. The Smithsonian Institution conducted explorations in Mesa Verde National Park, centering attention on excavating ruins under a well-considered plan of operation. In the Chaco Canyon National Monument the School of American Research is conducting excavations and the National Geographic Society reviewed the field for possibilities of future exploration work. The national parks and monuments were established because of the primary importance of their great scenic and historic background, and naturally there are no other localities that hold as rich promise of success to the student of geology, botany, zoology, anthropology, and ethnology as these remarkable areas.

The installation of museums wherever possible is therefore of great importance for a comprehensive exhibit of the flora, fauna, and perhaps the minerals of the region. The demands for such exhibits are particularly insistent.

Conservation of wild life.—The parks are sanctuaries for wild life and as such will forever have their place as living museums for zoology students. There is not a trip in the larger parks that does not secure a glimpse of deer, bear, or other large game. In the Yellowstone more than 15,000 visitors during the month of July alone viewed the buffalo herd located about a mile south of headquarters. This makes the protection of our wild life one of the most important functions of the National Park Service. Strenuous efforts were necessary during the year to preserve the elk herds of the Yellowstone from starvation and slaughter. The rigors of an unusually severe and protracted winter forced the game from the hills into the valleys and outside of the park boundaries in search of food. The available funds for the purchase of hay to feed these

animals within the park was exhausted before the breaking of the winter. Had it not been for the prompt response of private individuals and organizations to an appeal for funds, whereby nearly \$5,000 was given, the annihilation of these elk herds would have been complete.

The hunting of predatory animals by the ranger forces within the parks is carried on annually with great diligence and good results. As a result very gratifying increases have been observed in deer and other species that always suffered through the depredations of mountain lions, wolves, and other killers.

There is no sport in our national parks that is followed with greater enthusiasm and enjoyment than fishing. The Yellowstone, Yosemite, Glacier, Crater Lake, Rocky Mountain, Sequoia, and Lafayette National Parks in particular are famous for their fishing, and it was excellent during the greater part of the season. Through cooperation with the United States Bureau of Fisheries and the State fisheries the lakes and streams are kept well stocked. In Lafayette the Atlantic affords unlimited wealth in variety and size. Glacier Park and Yellowstone Park have United States fish hatcheries; the Rocky Mountain and Sequoia Parks have small State hatcheries. Hatcheries ought to be established on an adequate scale in every park where streams and lakes afford opportunities for fishing.

National parks in foreign countries.—The United States has been the pioneer in the national park movement. Beginning with the reservation of Hot Springs of Arkansas in 1832 and a definite withdrawal in 1872 of the Yellowstone Park area from private exploitation, not only has this country enlarged its national parks system in a very gratifying manner but foreign countries have done likewise. Australia has long been active in the overseas national park movement. Spain has studied our American methods of national park administration with a view to the establishment of national park areas in that country. Italy has a law in preparation for the formation of a national park. France and Sweden already have a number of excellent national parks. Switzerland has one; the Argentine Republic in South America has recently established a national park of great beauty, preserving some of its remarkable waterfalls. Canada's national parks are well known, constituting one of her greatest assets. It is indeed significant to note that these other countries have found it desirable to adopt a national park policy by setting aside their chief scenic areas for the recreational development and enjoyment of their people.

Yellowstone National Park, Wyo.—In many ways this has been a critical year and a strenuous one in the administration of Yellowstone National Park. Many irrigation and power schemes have

struck at the very heart of the park. The loss in wild animals, principally elk and deer, by starvation and slaughter outside of the park boundaries in an unprecedented winter was one of the trying situations that had to be met. The tremendous travel of last year, which increased about 28 per cent this year, taxed hotel and camping accommodations to their utmost capacities. Scarcity of labor, extraordinary high prices, and unfavorable weather have held back a large amount of the important work to be done by the public operators. All these problems have given the park management a great amount of additional work, which have taxed the time and help of the small force to an extreme limit.

It was nevertheless the park's most successful season. The elk and other wild animals were saved from extermination, irrigation projects were stopped, 79,777 visitors were cared for with scarcely any dissatisfaction or complaint, the roads were in excellent condition throughout the summer, and the hotels were vastly improved. Favorable weather conditions made camping and fishing opportunities unexcelled in the history of the park. The display of wild flowers and grasses made the park a veritable paradise during the tourist season. The heavy preceding winter, with its plenitude of snow, resulted in abundant ground water and nurtured the wild-flower exhibits to their greatest effectiveness, and also probably constituted the reason for a greater activity than usual on the part of many wonderful hot springs and geysers.

The dangers of the preceding winter to the great elk herds is easily evidenced when it is stated that both the northern and southern herds, numbering as many as 50,000 in 1912, were reduced by the spring of 1920 to a little over 20,000. Everything taken into consideration the winter of 1920 was a terrible one for the wild life of the Yellowstone region, and it is doubted whether the elk herds would survive more than one more such winter. Every bit of available Government hay was used, and strenuous efforts made to secure an additional supply. The Park Service funds were soon exhausted, but when the danger to the herds through starvation was called to the attention of individuals and societies nearly \$5,000 was immediately donated, resulting in the purchase of enough hay to tide them over the winter. The fact must, however, be squarely faced that the elk of the Yellowstone are not holding their own. There must be better protection for them in bad winters, else the elk will follow the course of many other species of wild life now only known from history. The purchase of hay ranches north of the park and in the Jackson Hole country will solve the situation. The open game season in adjoining States should also be restricted.

Attention is again called to Mr. Mondell's bill (H. R. 1412), which provides for the enlargement of Yellowstone Park into the Jackson

Hole region, including the addition of the Teton Mountains to the park. There is little opposition to this bill, and its passage at the next session of Congress should be speedily effected. There are undoubtedly a number of minor adjustments in the proposed boundary lines that are desirable, and these can easily be made without substantially altering the lines or the text of the bill.

The problem of opening the park roads in June to the tourist travel, especially in the higher altitudes, has always been a serious one on account of the huge drift of snow encountered. This was particularly serious at the beginning of the present tourist season, which opened on June 20 of this year. For several weeks before that date it was necessary to have the park roads open in order to enable the operators to get in the necessary supplies and equipment to operate the hotel, camp, and transportation system. On the 10th of May snow was so deep that it was impossible to move more than 4 miles south of Mammoth Hot Springs headquarters. There was no money to use on such a project. Under the superintendent's direction a snow plow was constructed by the master mechanic and placed in front of a 75-horsepower Holt caterpillar tractor with the idea of using the tractor to push the snow from the road. The success of the effort was astonishing; a roadway 11 feet wide was cleared from headquarters to Yellowstone Lake before June 1 in plenty of time to permit construction and repair work to be done on hotels and camps and their rationing before the season opened. Other park roads were consequently opened sooner than ever before. It was, however, impossible to take the tractor into Sylvan Pass on account of defective bridges, and that pass had to be shoveled out by road crews employed jointly by the National Park Service and Cody, Wyo., business men.

Nearly 80,000 people have visited Yellowstone since last year's report was in. Of these, 49,491 came in private automobiles and nearly 40,000 motorists brought their own equipment and camped out in the park, spending long periods in fishing, resting, and otherwise enjoying themselves. Camping places were enlarged and greater conveniences installed for these tourists, such as the piping of pure water, dragging in wood, erection of comfort stations, etc., but the lack of funds prevented the ideal development of these camping grounds. At the height of the season there were from 900 to 1,200 people in each of these public camping grounds, more than were housed in the near-by hotel and permanent camp combined. Modern garbage and sewage disposal systems for all these camp grounds should be speedily installed, and the Public Health Service is cooperating with the National Park Service to effect this.

The superintendent of the park is thoroughly alive to the need of additional betterments for the park, such as community shelters for

campers, better postal service, necessity for the enlargement of existing hotels and camps, and these will be carried into execution as soon as possible.

The park has always been famous for its fishing waters, but the heavy increase in travel in the past two years has somewhat reduced the fish supply in the streams. An extensive program of stocking depleted streams and restocking other waters was undertaken during the past summer. Over 2,000,000 fry from the Government hatchery were planted in the park in cooperation with the Bureau of Fisheries.

Yosemite National Park, Calif.—Again it is a pleasure to report that Yosemite Park has completed its greatest and most successful season, and has steadily forged ahead in improvements. That the people themselves appreciate what is being done for them in the Yosemite is plainly indicated by the ever-increasing throngs going there during the summer, even though approach roads are bad and many of the roads within the park are often in a state of disrepair on account of the shortage of funds.

Many important improvements have been noted. An especially fine example of comprehensive interdepartmental cooperation was evidenced by the work of the Post Office Department in completely reorganizing the postal service in the valley and improving it beyond the expectation of all concerned in the management and operation of the park. So well did the new system work that plans are now under consideration for the extension of postal facilities to the big public automobile camps, with a view to perfecting arrangements similar to the rural mail system to serve the campers. Similar effective cooperation was extended by the Public Health Service in the mosquito-control and sanitation work. Their official representatives cooperated in studying these problems and making recommendations for their solution.

The most notable improvement work undertaken by the Service during the season was the construction of a sewer system in the valley, including a main sewer with treatment and disposal plant.

The increased use of water by the public utilities, campers, and the Service itself has brought up the necessity for developing a new supply. The possible sources of this supply are now being studied.

The public utilities in the park rendered good service and plan for very extensive improvements in their properties. A large garage and automobile-repair shop and very attractive bungalow additions to their camping facilities were completed by the Yosemite National Park Co. Camp Curry also added a number of betterments to its plant.

Lack of appropriations to do ordinary maintenance work in the spring caused some of our park highways to fall into a serious state

of disrepair. Some of the roads rutted badly and then became excessively dusty. All of the roads of the valley should be hard surfaced, which means concrete paving, and the old roads above the valley should be rebuilt and sprinkling systems installed on all of them.

Last year over 18,000 people camped in the free public camps on the floor of the valley; this year they increased to 28,000, many of them spending the entire summer on their chosen pleasure grounds. On any given date of the season there was the population of a fair-sized city living in the public camps alone. The solution of problems of water supply and sanitation are therefore of transcending importance.

Sequoia National Park, Calif.—Unfortunately, this year does not see the legislation for the enlargement of the Sequoia Park that has been pending in Congress for several years enacted into law; it is highly desirable that at the coming session of Congress the passage of the bills still pending be accomplished.

This park, as practically all of the other larger parks, contains a considerable number of private holdings. Fortunately, during the year, all the lands in the park containing larger stands of giant sequoia were saved for all time for the public by the purchase from funds provided by a number of public-spirited citizens and their donation to the United States for inclusion in the park. This is a splendid example of giving, of which mention is made with particular pride and gratification.

Many important improvements were accomplished despite the smallness of the appropriation. In cooperation with the United States Public Health Service, the sanitary and water supply problems were studied and recommendations made for their solution.

To take adequate care of the tourist travel to this park a new hotel, camping, and transportation company was organized, and now operates under a two-year permit from the department. This company bought out a number of the smaller operators in the park and is planning extensive developments as soon as the enlargement bill is finally acted upon by Congress.

A log lounging room, with fireplace, and steam-heated cabins are now under construction. Before the termination of the fiscal year a new superintendent's residence and administration building will have been built.

General Grant National Park, Calif.—This beautiful and popular little park is steadily growing in popularity. It has just concluded a successful season, and upon the enlargement of Sequoia National Park by pending legislation will furnish one of the most important gateways to that park.

The newly installed public operator in the Sequoia National Park also is operating in the General Grant Park, and the accommodations and conveniences of the traveling public are therefore assured.

Glacier National Park, Mont.—This park too has seen its most successful year since its creation, travel this year exceeding that of last by over 18 per cent, an increase of 3,493 persons. All hotels, chalets, camps, and other conveniences were taxed to the fullest capacity, and the tourists were enthusiastic over their outings. Due to the climatic conditions the park season unfortunately is only three months, from June 15 to September 15.

This park is essentially a trail park and probably always will be and is therefore essentially a saddle-horse park. Many wild and remote regions that can not be fittingly developed and made accessible except by horse and foot trails will always add to the enjoyment of those who exert themselves the most and visit these places, either on foot or on horseback. With a steady influx of travel, such as was encountered this year, hotels and chalets will have to be enlarged. Trails have been extended as far as existing appropriations permitted, but additional trails are urgently needed, not only to serve the tourist but for use in fire fighting. Glacier Park is the one park that yearly is visited by numerous conflagrations; last year \$65,000 out of the \$85,000 appropriation for the park was spent in fighting these fires, which shows the need of passable trails as nothing else does.

From a transportation standpoint, undoubtedly the most important project is the construction of the transmountain road across the Continental Divide. At present the east and west sides of the park are divided as if a high board fence separated the two sides, with only loopholes for trails perceptible. Motorists to the park are not inclined to visit both sides, since the only means of transporting automobiles is to ship them by railroad from one side to the other unless a long detour is made. Of the new road construction projects in all the parks this is probably the most important; it is the great lacking link in the Park-to-Park Highway.

Fishing in the park was exceptionally good. The United States Bureau of Fisheries has a fish hatchery in the park, and thousands of fry were transplanted to stock lakes and streams. The park is rapidly obtaining a name as one of the best fishing places in the country.

Grand Canyon National Park, Ariz.—This closes the first year of the administration of the Grand Canyon as a member of the national park system. The National Park Service assumed charge on August 15, 1919, after Congress had granted a small initial appropriation for the administration and development of the area. The

formal dedication of the park to its great purpose took place on April 30 last.

Due to its southern location the park is an all-year resort. Based on estimates the travel up to October 12 of last year was 37,745 people; this year's travel amounted to 67,315, attesting the increasing popularity of this park.

Already in the short time the Park Service has had charge, a number of important improvements have been achieved. Stable and garage buildings, mess houses, and ranger quarters have been constructed, and roads and trails maintained in good condition. Prior to December of last year the park roads were solely for horse-drawn vehicles, but at that time the public operator installed motor-driven transportation busses for tourist travel and motors were admitted to the road. The civil engineering and landscape engineering divisions of the National Park Service have spent considerable time in studying the many problems encountered and have arrived at definite plans of development.

At present there is no means of road connection between the north and south rims across the Colorado River. Plans have been prepared for the construction of a suspension bridge across the river at this point to afford opportunities for horseback transportation between the north and south side. The construction of the bridge will undoubtedly be accomplished before the fiscal year is ended. The construction of a new trail to connect this bridge with the north rim is also planned under this season's operations. When both trail and bridge are completed one of the most interesting trips in the national park domain will be available to the tourist. Furthermore, without some means of animal travel between the north and south sides of the park, it is difficult to administer the north rim and provide for its proper development and use by park visitors. As soon as funds are available similar bridges will be built at other points already designated where engineering surveys have been made. All this development will carry with it increased demands for camps within the canyon itself and these will be speedily installed.

Due to the fact that existing roads on the south rim of the canyon were built for horse-drawn traffic, the installation of motor-driven transportation has rapidly disintegrated the existing roadbed. At present the Park Service is putting all its efforts toward keeping the roads in as good repair as possible, but widening of existing and the hard surfacing of both existing and proposed roads is absolutely imperative to insure satisfactory results.

The park area is particularly rich in archæological and prehistoric material from a scientific standpoint, but is for the most part yet unexplored.

One of the great engineering problems at the Canyon is how to secure an adequate supply of water. Every glass of water at present has to be hauled about 125 miles by railroad, carrying with it a tremendous daily overhead. This problem, too, is receiving the serious consideration of our engineers, and undoubtedly will eventually be solved satisfactorily.

A large number of mining claims in the Grand Canyon were held invalid by the department during the year, releasing considerable area desirable for future park development.

The history of game on the south rim of the Grand Canyon is a very interesting instance of the effect of national park protection. In a year's operation of the regulations, game animals are coming back into the park, and before long the whole south rim of the Grand Canyon will be alive again with native wild life in the same manner that the north rim is remarkable for the amount of antelope, deer, mountain sheep, and other indigenous wild animals encountered.

Mount Rainier National Park, Wash.—Travel to this park for the present season amounted to 56,491 visitors, an increase of 1,259 over the past season. This park in many ways holds a particular interest to the tourists, walking and horseback trips on the trails leading out of Paradise Valley along the trail system being very attractive features of a stay in the park. Many of the most prominent business men of the Northwest have taken an active interest in its tourist development, and are backing the expansion of the public utilities to meet the heavy demands. In fact, faith in the future of the park as a great tourist resort, and public spirit and civic pride combined, have already brought about a fine development. Existing hotels and camps were barely sufficient to meet the demands of an enthusiastic, inflowing crowd and, since the close of the season, the activities of the public operators are resulting in the enlargement of hotel and camping facilities to meet the demands of next season's business. As soon as the Carbon River Road is completed, which is one of the important road projects contemplated for the northwestern part of the park, they are prepared to erect hotel and other accommodations to meet the inflowing traffic at that point.

Unfortunately, because of the inadequacy of appropriations, the Service has not been able to adequately maintain roads and trails. There are only a relatively few miles of highway in the park, 20 miles in the southwest section and about 10 miles in the northeast corner. The former is the main traveled road to Paradise Valley, and is, of course, used by all cars going into and coming out of the park. The wear and tear on this highway is terrific. Gravel surfacing can not withstand the travel; the road must be paved, at least at the most important parts. This hard surfacing program is all the more impor-

tant, as both States and counties are paving the roads to the park entrances. A broad scheme of road development has been worked out which should be begun as soon as possible. The White River Road should be improved. The Carbon River Road should be constructed, and the Carbon and Nisqually Roads connected. The road between the Glacier Basin and the Carbon River Road should be completed.

There are now over 150 miles of trails in the park. Considerable trail improvement work was done during the year, but additional trails are an urgent necessity and some existing trails should be improved to a proper standard. Parking places, ranger stations, storage structures, shelter cabins, etc., are among the important needs of the immediate future.

In the sanitation of the park important improvements are urgently needed. Like the roads, the installation of sanitary facilities is an expensive thing to undertake, but one of the most vital necessities. Public camps, as well as hotel and other establishments, should have better facilities for sewerage and garbage disposal, but extensive sewage systems should be installed by the Government.

In this park, too, there has been more travel than in preceding seasons, though the increase is not as large as in other parks. Stormy weather in the early part of the season and shortage of gasoline in the surrounding territory, combined to discourage motor travel for awhile.

More ascents of Mount Rainier were made this year than ever before in one season, about 400 people climbing to the summit.

It has been officially determined from the records of the United States Coast and Geodetic Survey and the United States Geological Survey that Mount Whitney, with an altitude of 14,501 feet, is the highest mountain in the United States; that Mount Elbert, in Colorado, ranks second with 14,420 feet; and that Mount Rainier, with an altitude of 14,408 feet, takes third place. Neither Mount Whitney nor Mount Elbert, however, are as impressive as Mount Rainier, nor do they offer the same opportunities for thrilling mountain climbing.

Crater Lake National Park, Oreg.—So far as travel, climate, road conditions, and the maintenance and protection of the park were concerned the Crater Lake season of 1920 was the most successful of its history. Every factor of operation excepting one was considered satisfactory; the exception was the operation of the hotel and camp accommodations, which was not up to the standard. As a result the present operator has been given notice that his services to the public have not been satisfactory and a reorganization is being insisted on. The governor of Oregon and other citizens of that State have given their personal attention to the rehabilitation of the Crater Lake

utilities through the purchase of the property from the present owners, and undoubtedly a complete, satisfactory reorganization can be effected in time to offer proper service to the traveling public next season. Roads and trails within the park were in good condition throughout the summer. There are now 57 miles of roads and 34 miles of trails. The roads were open earlier this year than ever before.

Roads leading to the park from the east and west slopes of the Cascades were not in good condition. These highways, however, are slated for improvement under the Federal road act.

Bills in Congress to enlarge the Crater Lake National Park northward by the addition of the Diamond Lake region and Mount Thielson, approved by the Department of the Interior, have not yet received the sanction of Congress. The enactment of this legislation into law is one of the important prerequisites to the adequate development of Crater Lake Park. The enlargement would open to the motorist fine camping grounds, with ample water; roads with excellent trails could be built from Diamond Lake to the Crater without great difficulty; Diamond Lake itself is shallow, offering excellent opportunities for bathing, while good fishing abounds. It is ideal from a camper's standpoint.

Fishing in Crater Lake itself was excellent this year, many large trout being taken by enthusiastic anglers. Smaller game has been numerous, but bears, always attractive and interesting, have been scarcer this year than usual. Undoubtedly bear and deer were driven down from the heights into the territory outside the park by the snows and killed. The necessity of additional game preserves is therefore apparent.

Rocky Mountain National Park., Colo.—Travel to this park reached the enormous total of 240,960 visitors, an increase of 42 per cent over that of last year, attesting to its great popularity with the touring public.

Of even greater importance, however, was the completion of the Fall River Road, connecting the east and west sides of the park, which has been in course of construction for many years. It was surveyed and partly built prior to the establishment of the park. Although not quite ready yet for general automobile travel, cars can pass over the entire distance between Estes Park on the east and Grand Lake on the west. Certain adjustments in alignment and construction will have to be made, but, as the State considers it has fulfilled its agreement with the Federal Government when it finishes the work, the alignment and reconstruction of certain portions of the road will undoubtedly have to be attended to by the National Park Service. The opening of this road affords a wonderful circle trip that will compare with any other similar trip in the world, beginning

and ending at Denver and taking the visitor twice across the Continental Divide, a total distance of 213 miles, and reaching at a point an altitude of 11,797 feet.

For a number of years Congress granted only \$10,000 a year toward the maintenance and improvement of this great park, but last year this appropriation was increased to \$40,000. Obviously the former sum permitted of no extensive maintenance or improvement work, and roads, trails, bridges, and other travel facilities rapidly deteriorated from the constant heavy travel over them. With an increased working fund this year, it has been possible to perform considerable maintenance work on roads long neglected.

The park's development has received careful study from both the civil engineering and the landscape engineering forces of the Park Service, and a satisfactory plan of development has been prepared.

Despite the fact that hotels and lodges in the parks were enlarged to accommodate additional guests and a new hotel and camp, with a large capacity, erected in the park near Grand Lake, the heavy travel resulted in a scarcity of rooms throughout the summer. Further expansion is essential if visitors are to be properly cared for. The transportation operator has rendered extraordinarily fine service at reasonable rates.

Although no action has been taken this year looking to the addition of the Mount Evans area, of approximately 100 square miles, to the Rocky Mountain National Park, this project is a meritorious one and should be given favorable consideration by Congress.

Mesa Verde National Park, Colo.—Mesa Verde has just closed its most successful season, since never before have as many visitors entered its gates as this year. The travel to this park amounted to 2,890 visitors, an increase of 603 over the past season.

Small appropriations precluded the performance of much improvement work aside from that involved in bettering the principal roads and trails to the principal points of interest. Nevertheless, considerable work of importance was accomplished. A short road was constructed from Sun Temple to a spectacular point on the rim of one of the near-by canyons, thus affording a most comprehensive view of the ruins and canyon and the forest. Three trails were built, filling a long-felt need of the visitor who delights in exploring this fascinating region.

The only establishment for the accommodation of tourists in the park, Spruce Tree Camp, was improved by the addition of bath-houses and improvement of the water supply.

One of the most interesting features to park visitors is the museum which has been established. Each year it grows in importance as new exhibits are added. The present structure should be enlarged and fireproof protection afforded its valuable relics. There is an oppor-

tunity to make this museum one of the most popular and noted in the whole United States.

The appropriation by Congress included funds for the continuance of excavation and restoration work on the ruins. Dr. J. Walter Fewkes, chief of the Bureau of American Ethnology of the National Museum, continued his archaeological work during the year, excavating and restoring what had been called "Painted House," one of the important ruins. His research during the summer disclosed the interesting information that this was the building in which the sacred fire was constantly kept burning, and the change of the name of this ruin to New Fire Temple was therefore effected. The work of excavating the ruins of Mesa Verde has scarcely begun. True, the cliff dwellings have nearly all been examined. These are in the canyons. There are, however, on the mesa scores of mounds under which whole villages lie buried. It would be desirable to investigate these mounds under cooperative arrangements similar to those we have been able to make with the Smithsonian Institution.

The importance of this park to the traveling public, as evidenced by the travel figures of the past season, indicates that there is necessity for extending the road system within the park to provide for its greater accessibility. One of the important projects is the construction of a road from the present Chapin Mesa Road, which connects most of the roads now accessible with the Cortez-Ship Rock Road, south of the park. When this road is built it will open access to the Mesa Verde Park as far as Gallup, N. Mex., placing the park squarely on the Park to Park Highway. A highway from the head of Chapin Mesa to Wetherill Mesa is also of the greatest urgency.

Zion National Park, Utah.—This area, for several years a national monument, was included in the national park family by act of Congress on November 19, 1919. Its dedication took place on September 15 of this year under the most auspicious conditions. It is easily Utah's scenic masterpiece and I predict a great destiny for it.

Recognizing its establishment as a national park, Congress granted an initial appropriation of \$7,300 for maintenance and improvement work during this present fiscal year. Unfortunately a disastrous flood seriously injured the main road in the park in several places, and, besides destroying the bridge which cut off access to the Little Zion Canyon for a considerable period, resulted in curtailing park travel and necessitating the use of funds which were exceedingly important for park purposes. Already the establishment of the park and the appropriation of Federal funds for its upkeep and improvement have wrought great changes for the better in this remarkable region. Public attention has been fixed on it and travel stimulated to it. The State of Utah has taken a great interest

in the park and is doing everything within its power to cooperate with the National Park Service in the protection of the new national park. The State established a game preserve north of the park, which has already had a salutary effect.

Wind Cave National Park, S. Dak.—Unusually bad weather in the early summer discouraged travel to Wind Cave National Park in South Dakota, with the result that the total number of visitors this year was not much in excess of last year's record. Although no improvement work could be accomplished, the park has been kept in good condition throughout the year, but a great deal of necessary repairs to buildings and equipment were deferred until more funds are available. The bridges on the park roads are in a state of dangerous delapidation and will have to be replaced by new structures. This national park will be an important figure in the transcontinental travel; a new transcontinental highway, designated the Black and Yellow Trail, leads across South Dakota through the Black Hills region to Yellowstone Park, running close to the park, will make Wind Cave one of the main features of the trail. The Biological Survey maintains a game preserve on the park, covering 4,160 acres, under fence, which forms an important attraction to the visitors.

Lafayette National Park, Me.—The only national park east of the Mississippi, Lafayette, has also participated in the heavy flow of tourist travel to the parks. Many of the tourists came with motor camping outfit, as they do in the West, the park offering fine opportunities for such pastime. The whole of New England is interested in furthering travel to the park, and a plan is now under consideration for marking important through routes to the park from other centers. The estimate for travel to the Lafayette Park this season amounts to 66,500 visitors, the register showing tourists coming from 29 States. Only a fraction of the visitors, however, sign the register. The unusual and remarkable feature about this park is that it is composed entirely of lands donated by public-spirited citizens. During the past year donations to this area by important gifts indicate a continued warm interest that Lafayette Park inspires. These gifts of land are now being prepared for acceptance by the Government, awaiting only for the clearance of the titles.

As a game sanctuary the park is also performing one of the important functions of the national park system. Wild life has been increasing, seemingly having already realized the protection afforded by the national park. The Maine State Fish and Game Commission is cooperating by employing a warden strictly to enforce the game laws in the park and the maintenance of a true wild-life sanctuary within the park itself.

As in other parks, funds available during the past season permitted little beyond administration, protection, and maintenance. Besides the maintenance of existing trails, new trails and paths, road and bridle paths are needed. Ranger huts and adequate fire protection to these wonderful forests must also be installed as soon as possible.

The park has a great future for development of winter sports. Ice boating and skating were popular, and when snow fell, snowshoeing, skiing, and tobogganning were enjoyed daily. With the development of winter sports Lafayette Park will indeed be as popular a resort for winter tourists as it is now for summer.

Hot Springs Reservation, Ark.—A most notable event of the year in Hot Springs Reservation affairs was the beginning of the construction of the new Government free bathhouse. The ground for this structure was donated by public-spirited citizens. The construction began January 1, 1920. The supervision of the erection of the building is the personal work of Col. John R. Fordyce, who, actuated by a desire to carry on his distinguished father's work in the up-building of Hot Springs and to do honor to his memory by a special service to the park, tendered his services for Government improvement work at Hot Springs. He serves as a consulting engineer of the Park Service at a salary of \$12 per year. Although the initial appropriation for the free bathhouse would have been adequate under normal times, the tremendous increase in the cost of labor and materials will necessitate an additional appropriation to consummate its completion.

The importance of the free bathhouse and the necessity of its being placed in commission at the earliest practicable date are clearly evident upon consideration of the fact that during the 1920 fiscal year 100,669 baths were given to indigent sick in the dilapidated old bathhouse which the new structure will supersede, an increase of nearly 40,000 baths over those given in 1919. The daily number of indigent bathed was 327.

Considerable attention has been given to a comprehensive housing plan to provide sleeping accommodations and facilities for feeding the sick who visit the park in search of health. This is not easy to accomplish, but with the aid of individuals and organizations already engaged in work of this nature something practicable will, I trust, come out of this idea. This is really not a plan within the scope of the Federal Government's activities; all funds appropriated for the reservation should go into the development and improvement of the reservation.

A comprehensive plan of development of the whole reservation has already been prepared by the Service, and as appropriations are made by Congress for the individual developments, these can be carried forward intelligently and expeditiously to completion.

The most desirable road project is the construction of a road to the top of West Mountain. The city of Hot Springs has indicated its intention to cooperate with the Service in extending this road improvement as part of the general scheme to develop Hot Springs as a pleasure park as well as a health resort. Roads and trails in general are needed to carry this scheme to a satisfactory conclusion.

Recently there has been a discussion of the possible extension of the park itself to include forest areas lying between Hot Springs and Mountain Valley, with the idea of ultimately constructing automobile roads in this region and opening up extensive camping grounds. This suggestion carries interesting possibilities.

Aside from the fact that more people visited the reservation during the year than ever before, the bathhouses enjoyed unusually heavy patronage. The total number of baths sold was 870,731 as compared with 729,997 in 1919, a gain of 140,734 paid baths over the past year. The gain and net profits of the bathhouses over the 1919 figures was \$100,200.68; including the charitable institution the total number of baths given in all the bathhouses was 978,772, almost a million.

Platt National Park, Okla.—A slight increase in the appropriation for this park has enabled the Service to install several important comfort stations and extend the sewer system. The park is extremely popular, and because of this popularity is very much used, thereby requiring considerable maintenance work. The small appropriation has not enabled the service to do more than cover the most urgent repair work. This park also, by the transfer of elk and buffalo from Yellowstone Park and the Wichita National Game Preserve, has taken its place as an important game preserve. The expenses of transporting these animals were defrayed by the contribution of funds by generous public-spirited Oklahoma citizens. Automobile camp grounds were enlarged and improved, making the park more than ever popular as a resort for motorists. The medicinal quality of the springs in this park make the waters very much sought after, 40,251 gallons of bromide water, 10,657 gallons of mineral water, and 5,383 gallons of sodium and chloride water were taken from the reservation by visitors.

Sullys Hill National Park, N. Dak.—This park containing an important game preserve maintained by the United States Biological Survey, has a considerable amount of interest from a tourist standpoint attached to it. It is close to the Theodore Roosevelt International Highway, extending from Portland, Me., to Portland, Oreg.

Hawaii National Park, Hawaiian Islands.—Active maintenance and improvement of this park has not yet been undertaken as no funds for that purpose have thus far been granted by Congress. By act, approved February 27, 1920, Congress authorized the Governor

of Hawaii to exchange territorial lands for private lands of equal value in the Hawaii National Park, and negotiations during the year between the Territory and private land owners has resulted in the development of several exchange propositions.

Lassen Volcanic National Park, Calif.—Congress granted a small initial appropriation of \$2,500 for the protection and improvement of this park, practically all of which is being spent for the improvement of roads and trails under cooperative arrangement with the Department of Agriculture.

Mount McKinley National Park, Alaska.—No appropriations have been made for this park and, therefore, no control over the area has been established. One of the important characteristics of this great area is the large amount of game, but no protection could be afforded up to this time except such as it received from the small game warden force of the Territory of Alaska. Appropriations should be granted at least to prevent poaching on the park area.

Capulin Mountain National Monument, N. Mex.—With its chief characteristic the crater of an extinct volcano this area proved very popular to picnicking parties. A survey of the monument area is being made to serve as a basis for future need.

Casa Grande National Monument, Ariz.—Considerable, but inexpensive, important improvement work was accomplished here. The area was kept in a satisfactory condition, and park areas for visiting motors provided and kept in good condition. The drawing power of the historic exhibits on this monument was emphasized by the large increase in travel.

Chaco Canyon National Monument, N. Mex.—Archaeological and other scientific societies have given this interesting monument particular attention. Excavations are being conducted by the School of American Research of Santa Fe, and the National Geographic Society conducted a reconnoissance survey for the entire area, with a view to forming plans for its possible excavation on a large scale.

Devils Tower National Monument, Wyo.—The road leading through the monument to the base of the tower was repaired and extended. A good spring on the grounds makes this a popular rendezvous for tourists.

Dinosaur National Monument, Utah.—For years the Carnegie Institute of Pittsburgh, Pa., under permit from the department, has been excavating large quantities of the gigantic fossils found in this area and are still continuing this work.

El Morro National Monument, N. Mex.—The protection of the many historic inscriptions carved on El Morro Rock by the early Spanish pioneers constitutes the chief problem here. How to prevent vandals chipping out sections of the inscriptions, or chiseling their names on the walls, and how to protect the inscriptions from the wear and tear

of the elements, has been receiving the study of the landscape engineers of the Park Service. Before this season is over this problem will be solved. The marking of trails, placing of warning signs, and other improvements have been made from the small funds available.

Katmai National Monument, Alaska.—With an area of over a million acres, and manifold beautiful and awe-inspiring volcanic phenomena, Katmai is by far the largest and most spectacular of the monument system. The National Geographic Society has sent five expeditions into this area, gathering a mass of invaluable scientific data that is now being collated and developed.

Montezuma Castle National Monument, Ariz.—In order to prevent acts of vandalism and also to watch the ruins themselves for signs of disintegration, arrangements have been made for a local custodian from among the neighboring ranchers. Preparations have also been made for the construction of several trails, which have been urgently needed.

Muir Woods National Monument, Calif.—Due to its proximity to San Francisco, Muir Woods annually draws throngs of admiring visitors. The entire tract was donated by Mr. William Kent, who is arranging to enlarge the monument by the donation of additional tracts. Its popularity for picnicking makes it a difficult matter to keep the area looking attractive with the small funds at our disposal. Three small log cabins for the convenience of the public were built, trails kept free from brush, and all bridges and other structures kept in good repair.

Navajo National Monument, Ariz.—Representatives of the Smithsonian Institution spent considerable time in a survey of the prehistoric ruins here. The restoration of many of these exhibits is urgently needed, because the ravages of time and the elements are playing havoc with their condition.

Papago Saguaro National Monument, Ariz.—Situated on the highway between Tempe and Phoenix, this monument is visited each year by many travelers. The appointment of a custodian at a nominal salary last year resulted in a careful patrol of the area from time to time and better protection to its wonderful cactii exhibits.

Petrified Forest National Monument, Ariz.—Situated near both the transcontinental railroad and an automobile highway, this monument from year to year receives an increasing number of visitors to inspect the many natural curiosities; 1920 saw 1,000 per cent increase in visitors over 1919. The ground is covered with fossilized wood, some of which has assumed the most brilliant colors. Roads within the monument were improved through a small allotment made for that purpose. Its popularity will undoubtedly require the appointment of a ranger for policing and protection purposes before long.

Scotts Bluff National Monument, Nebr.—This is one of the recent monument creations, constituting an important landmark in the State of Nebraska. Many famous old historic trails, including the Oregon and Overland Trails, passed over this area. A custodian at a nominal salary assumed charge during the year, who directed his efforts principally toward keeping the monument grounds in as slightly a condition as possible. It is a very popular picnicking place.

Sitka National Monument, Alaska.—Situated only 1 mile from Sitka, Alaska, this monument, with its many interesting exhibits of totem poles, receives a large number of visitors. The totem poles were painted and the entire grounds kept in neat condition.

Tumacacori National Monument, Ariz.—This splendid relic of early Franciscan missions is one of the most popular and valuable exhibits in the national monument system. Mr. Frank Pinkley, the custodian of the Casa Grande National Monument, without additional compensation, administers the Tumacacori. The neighboring towns have always manifested a great interest in the protection of the old mission, and with their cooperation complete roofing of the structure, long delayed, will probably be effected during the present year. The Service has been able to allot \$800 toward this improvement on condition that the towns contribute the remainder of the amount needed.

Other national monuments.—Nothing of a particular note has transpired in connection with the Colorado, Gran Quivira, Lewis and Clark Cavern Natural Bridges, Rainbow Bridge, Pinnacles, Shoshone Cavern, Verendrye, and Yucca House National Monuments; they either do not require improvements or are not susceptible of development except at great expense.

THE TERRITORIES.

Since the transfer under Executive order of July 15, 1909, of the supervision of affairs in Porto Rico to the Insular Bureau of the War Department, the former Territories of New Mexico and Arizona have been admitted as States, and there now remains under this department the supervision of but two Territories—Alaska and Hawaii.

ALASKA.

In the report of the governor for the fiscal year ended June 30, 1920, he draws attention to the lack of coordination in the policy of the Government toward the Territories and states that while an honest effort is being made to open up the country to development, principally through the construction of the railroad from Seward to Fairbanks, still development is retarded by federal prohibitions probably enacted for an ideal of conservation but which do not make

for conservation except as they are prohibitive. He expresses the opinion that federal government for Alaska should be administered by officials in the Territory itself and strongly advocates the enactment of the Lane-Curry Alaska development board bill (H. R. 12870, 66th Cong., 2d sess.), so providing. Transportation, it is stated, is the most serious problem and weighs heavily on all dependent upon common carriers for service; increased tariffs can ill be borne, and there appears to be no relief excepting through a subsidy in one way or another.

While there is much that is discouraging, fortunately there are two sides; the population is optimistic that remedial legislation will be forthcoming. There is hope in new lode mine discoveries and in possible establishment of paper and pulp industries when the regulations of the Forest Service shall have been made acceptable to prospective investors. Reindeer herding is becoming an economic factor and farming has developed to the extent of making the Territory largely self-supporting. The scientific bureaus of the Government, where their functions are advisory and not regulatory, are rendering wholesome service.

Population.—The taking of the 1920 census was delegated to the personnel in Alaska of the Bureau of Education, as their forces are closely in touch with all parts of the Territory. The returns are not all in, but the governor estimates there are 30,000 whites and 20,000 natives of full or mixed blood in the Territory.

Commerce.—The total commerce for the calendar year 1919 was \$109,652,339, a decrease of \$17,496,793. The total commerce with the United States was \$106,586,095 as against \$124,436,491 in 1919, a decrease of \$17,850,396. The principal decreases and increases over 1919 are in the values of the exports of canned salmon in which there was a decrease of \$6,843,915; in fresh fish other than salmon a decrease of \$374,320, and in canned herring an increase of \$566,380. There was a noticeable increase in the value of clams, shrimps, fish fertilizer, etc. A run of salmon smaller than the average is the cause for the decreased value of the pack.

The value of the output of gold and silver dropped from \$8,997,655 in 1918 to \$8,636,139 in 1919, a decrease of \$361,516; copper exports dropped from \$18,156,051 to \$10,304,807, a decrease of \$7,851,244. A slump in the copper market not only caused a curtailment of production, but affected the value of the ore shipped. The decrease in imports amounted to \$2,668,305, due largely to reduced mining and fishery operations.

Transportation.—As shown in the report, transportation is the great outstanding problem. The governor favors the enactment of the bill introduced into the Senate of the United States, at the in-

stance of the Territorial shipping board, levying a tonnage tax on all shipping to and in the Territory, and with the fund so raised and through the power of contract build up regular and regional service upon equitable rates and schedules. He does not favor the recommendation of the interdepartmental board appointed by and at the request of the Secretary of the Interior that the steamship lines be consolidated.

Wagon roads and trails.—There are three principal road and trail building agencies in the Territory—The Alaska Road Commission of the War Department, the Bureau of Public Roads constructing roads within national forests under section 8 of the Federal-aid roads act in cooperation with the Territorial authority, and the Territorial road commission acting under authority of the legislature. A small amount annually available to the forestry officials is chiefly used in making trails. A cooperative spirit has been shown on the part of all concerned, with the result that roads are now being built along mutually agreed upon plans, and if only more money could be made available extending over a period of years, Alaska would soon have a comprehensive system of wagon roads. Wagon roads will do more toward internal development than will almost any project. The governor recommends the extension of all the provisions of the public-aid roads act to Alaska in the same way as to the States, and authorizations and appropriations for the Alaska Road Commission to enable it to inaugurate a 10-year building program. The appropriation for the next fiscal year should be approximately \$1,000,000. There should be an appropriation for the construction of feeder wagon roads to the Government railroad.

Alaskan Engineering Commission.—Not a great deal was accomplished in actual new construction of the Government railroad in Alaska during the first few months of the fiscal year 1920 because of the lack of appropriation and the uncertainty surrounding it. The original authorization of \$35,000,000 was almost exhausted and data was being assembled for presentation to Congress asking for an additional authorization of \$17,000,000. This was presented in July, 1919, and after extended hearings Congress granted the additional authorization in an act which was approved by the President on October 18, 1919 (Public No. 59). Of course, during these months the road was operated and maintained as well as possible under the circumstances, and some construction work done.

A plan of work was adopted in the early autumn which in its essential part embodied the following features:

Operation of a steamer to transport labor to and from Alaska, the labor forces in the Territory being entirely inadequate for the prosecution of the work.

Purchase of supplies in the States sufficiently in advance for shipment to Alaska and their distribution along line over snow and ice during winter months.

Establishment of a supply division to attend to the securing and shipment of labor, handling of shipping of materials and supplies, and to have general supervision over placing of orders for supplies, etc.

Consolidation of Seward and Anchorage divisions into one organization (southern division).

Completion of 1919 construction program on snowsheds, tunnel enlargement, and new bridge work between miles 40 and 60.

Continuance of work on reconstruction and rehabilitation, also ballasting, etc., of old Alaska Northern line.

Grading from mile 236 to 261, some parts of which had been finished but later damaged by action of river, rain, and snow.

Working of a few pile driver and bridge gangs all winter between 'Ialkeetna and mile 261.

Attacking during winter of grading work from crossing of Susitna River to and including Rocky Canyon of Indian River, providing wagon road for freighting supplies ahead through Chulitna Pass to Hurricane Gulch.

Clearing of right of way for remainder of distance between miles 261 and 360, gangs working from both ends.

Stripping heavy moss from some of larger cuts to permit thawing.

Construction of wagon road from Indian River through Broad Pass to connect with similar road on northern division.

Pushing forward of supplies, contractors' equipment, etc., for use in grading as far as Hurricane Gulch during summer of 1920 to permit construction of big steel-arch span over this gulch in winter of 1920 and 1921.

Completion of line north of Tanana River to Gold Stream and operation as narrow-gauge line in connection with Tanana Valley Railroad as one unit.

Extension of track southward from Nenana to mile 358 (foot of Nenana Canyon).

Transfer of supplies to new camp at mile 358 for attacking heavy work in Nenana Canyon.

Congress having appropriated \$6,000,000 on November 4, 1919, the plans as outlined were set in motion. The rehabilitation work on the Alaska Northern portion of the line reached the stage permitting the use of heavy locomotives and cars for the entire distance. To accomplish this, however, necessitated the construction of a switch-back in mile 48 to eliminate the use of the high trestle, which was unsafe and will be replaced with a structure for permanent use.

The snowsheds as planned and the tunnel enlargements were completed and good progress made on the bridge work.

In new construction on the southern division track was extended to mile 242½ by the end of June, 1920. Good progress was also made in new grading work northward to Hurricane Gulch, mile 284, and in making ready for track the grade constructed some months before.

Owing to a most heavy and unusual fall of snow with accompanying complications, the road construction and delivery of supplies northward from end of track were considerably hampered. However, by augmenting the transportation service with two river boats on the Susitna River in the early summer of 1920, sufficient supplies have been kept at the front to enable operations to continue.

Contracts have been let for practically all clearing of right of way remaining to be done. Clearing has been completed northward to mile 267½, and with the exception of about 8 miles, northward to mile 284.

On January 30, 1920, a contract was closed with the United States Steel Products Co. for furnishing and erecting the first large steel bridge on the line as one progresses inland from Seward. This is the bridge over the Susitna River at mile 264, known as the Gold Creek crossing. The fabrication of this bridge was commenced soon thereafter, and it is contemplated that it will be erected during the fall of 1920 and winter of 1920-21.

The wharf facilities at Anchorage, including dredging, were completed to such extent that the largest vessels in the Alaska trade may tie up at the dock at all stages of the tide.

On the northern division (old Fairbanks division) the main line has been completed between the north bank of the Tanana River and Fairbanks, and track has been extended southward to mile 358, the foot of Nenana Canyon. Contracts for grading and tunnel work in the Nenana Canyon have been let and good progress made, considering adverse circumstances mentioned further on. Clearing has been completed on the division to mile 333.

The rehabilitation work on the Tanana Valley lines has been continued.

The branch line to Chena, no longer serving any useful purpose, inasmuch as the main line from Nenana to Fairbanks is completed, was taken up and the rail used elsewhere.

The operation and construction activities in this division were greatly retarded by the severe epidemic of Spanish influenza, which belatedly prevailed during the spring of 1920. Many deaths resulted therefrom and the physical weakness and demoralization accompanying the epidemic were greatly felt.

As stated above, when the program was formulated it was recognized that the labor situation would continue acute. However, after

thorough investigation it was found inadvisable for the commission to operate a steamer of its own for the transportation of labor. Instead, an agreement was entered into with the two steamship lines operating to Seward and Anchorage for reduced rates for men and material. Under the arrangement, 715 unskilled laborers were shipped between January 1 and June 30, and details completed for the shipment of approximately 500 more laborers during the first few weeks of the fiscal year 1921. A great many more men could have been used, but could not be obtained.

The supply division was established as planned, with an office at Seward, and just before the close of the fiscal year moved to Anchorage to enable a close touch to be kept with the headquarters office.

During the past year the Alaskan Engineering Commission has employed from 75 to 85 men at Eska and from 30 to 35 at Chickaloon to furnish fuel for the Government railroad and to prospect that portion of the Matanuska coal field immediately tributary to Chickaloon.

At Eska there are six coal beds under exploration, the average thickness approximating 3 feet. Upon these beds over 9 miles of underground workings have been driven since the commission acquired the property in 1917, providing over 3,300 tons monthly for the commission's current uses and blocking out over 100,000 tons for the future. This mine is not gaseous, and roof and floor conditions are good so that but few injuries have resulted from accidents underground. During the past two years Mr. Theodore Chapin, of the United States Geological Survey, has made extensive study of the geological conditions both at this mine and at Chickaloon, the results being published by the United States Geological Survey in Bulletin 712-E.

At Eska there has been considerable faulting, but the outcrops of the extensions of the beds now under exploration have been determined during the past year by open cutting and churn drilling and crosscuts started, which will insure fuel in sufficient quantities for the commission's needs for many years to come.

At Chickaloon a 45° slope has been sunk along the strike of the coal and a second level opened approximately 250 feet below the first.

Several new cottages have been constructed for the families of married employees, the camp wired, and a small electric lighting set installed.

On June 17, 1920, a cooperative agreement was entered into between the Navy Department and the Department of the Interior, whereby the Chickaloon mine, theretofore operated by this commission, was taken over July 1, 1920, for the purpose of mining coal for the Navy.

The road when completed will be of great benefit to all interior development, particularly if needed feeder wagon roads are con

structed. The Territorial road commission and the Alaska Road Commission are cooperating as far as possible, but in the effort to make the road self-supporting provision should be made for a comprehensive system of roads into all the tributary mining and agricultural districts. There should also be a determined effort to direct settlers, prospectors, and capital to the many resources in the country traversed.

Mail service.—Great discontent is still being manifested over the inadequate mail service; mail to Alaska is still shipped as freight or express and often comes badly damaged; this is particularly true of shipments by parcel post. Mail freight seems to be handled with no more consideration than ordinary freight. The Post Office Department and the steamship companies appear to be unable to agree on any form of mail contract, and in the meanwhile the public suffers.

Labor.—There has been a shortage of labor due to the demand in the States where wages nearly the equal of wages in the Territory are paid; the condition of laboring men, however, is really better therein and the opportunities for saving superior on account of low rents, moderate prices of merchandise, and the lesser opportunity of spending on amusements and clothing. There have been only minor labor disturbances throughout the year.

Mining conditions.—While mining operations are greatly handicapped on account of high operating costs and bad transportation facilities, still the outlook is most hopeful. There are new developments in lode mining in the Kuskokwim Valley, the Kantishna district, on Chichagof and Admiralty Islands, Lynn Canal, Portland Canal, at Broad Pass and Cape Prince of Wales. Stirred by recent finds there are more prospectors in the hills than for some time past. The governor favors a premium on gold to be paid to the producer from taxes on manufactured gold.

Coal and oil.—Coal is being mined in the Matanuska field by the Navy Department; mine development is in progress in the Bering River field and lignite is mined in the Nenana field for the railroad and for local consumption. The governor advocates remission of all royalties and rentals on coal lands until the period of development is past. The passage of the oil-leasing act resulted in a stampede to the known oil fields, and a large number of applications have been filed for prospecting permits, with considerable resulting confusion over staking. Only one company is producing and refining and that on a small scale from the one patented claim. Alaska petroleum compares favorably with the best Pennsylvania product.

United States Geological Survey and United States Bureau of Mines.—The governor highly commends the work of the Geological Survey and of the Bureau of Mines and recommends an extension of their activities.

The Geological Survey maintains a suboffice at Anchorage in charge of a competent geologist who, in addition to advising miners and prospectors, also acts in a consulting capacity for the Government coal mines. Water power investigation in southeastern Alaska is conducted by the Survey in cooperation with the Forest Service. The Bureau of Mines has an experiment station at Fairbanks where most helpful experiments are conducted and full advice given to mining men.

Mining in Alaska in 1919.—The winning of some \$20,000 worth of gold from placer mines near Juneau in 1880 marked the beginning of the great mining industry of Alaska, the value of whose total product up to the close of 1919 is \$438,161,000. The developed mineral deposits are chiefly gold and copper; hence, the mining industry in 1919 was subject to the same depression that affected gold and copper mining throughout the world; this fact explains in large measure why the value of the Territory's mineral output in 1919 is only about \$19,620,000, while that of 1918 was \$28,254,000.

The mineral output in 1919 is the smallest made in any year since 1910, and its value is less than half that of the output in 1916 (\$48,600,000). The abnormal production in 1916, chiefly that of three large mines, was due to the high price of copper during the war, which greatly stimulated copper mining. With the fall in the price of copper, the copper industry reverted to more normal prewar conditions. Meanwhile the world-wide depression in gold mining consequent upon high operating costs brought on by the war has seriously crippled the other important mining industry. As a consequence the value of the annual output of gold declined from \$16,700,000 in 1916 to \$9,426,000 in 1919.

Approximate value of Alaska's mineral products in 1919.

Gold	\$9, 426, 032
Copper	8, 783, 063
Silver	705, 273
Coal	343, 547
Lead	72, 822
Tin	73, 400
Platinum, palladium, petroleum, marble, and gypsum	216, 776
Total	19, 620, 913

Public lands.—The records of the surveyor general's office show that during the fiscal year ended June 30, 1920, there were 18 township surveys, whole and fractional—surveys covering 612.28 miles; of these 5 townships were on the Copper River meridian, 7 on the Fairbanks meridian, and 6 on the Seward meridian. There have been surveyed to date 152 townships, whole and fractional; 88 on the Seward meridian, 46 on the Fairbanks meridian, and 18

on the Copper River meridian. The governor renews his recommendations of the past two years for the consolidation of all the different branches of the General Land Office into one centralized office, so that all matters dealing with public lands in the Territory may be expedited. He also again recommends that the office of surveyor general and secretary of the Territory be separated, as the two offices have nothing in common.

National forests.—After a long period of inactivity it begins to appear as though there is to be considerable development in connection with the national forests, particularly in southeastern Alaska. A number of companies interested in the manufacture of pulp and paper are negotiating for leases of timber, and when the offered leases can be smoothed out, so as to offer satisfactory terms, doubtless several mills adjoining constant water powers will be established. The leases as now offered by the Forest Service cover a period of 30 years, with an allowed two-year period for construction; the stumpage rate is set for the first five years and a maximum stumpage rate for the following five years. For the remaining five-year periods the Forest Service reserves the right to fix the stumpage on prevailing timber rates in the district, but will fix no exact basis on which the revaluation will be made. This is the stumbling block, and to the governor it appears to be a short-sighted policy to keep out industry for fear that a proper price for future stumpage will not be received. The income tax will now be with us for many years and the greater the income of any company the greater will be the revenue to the Government. He recommends that a forest district be established in Alaska in charge of a district forester conversant with Alaskan conditions, who may act without delay incident to correspondence.

There are two great national forests in Alaska—the Chugach, comprising 5,130,201 acres, and the Tongass, comprising 15,449,539 acres. The total receipts from the Tongass and Chugach National Forests for the fiscal year ended June 30, 1920, were \$106,921.48. The total cost of administration of the two forests for the same period was \$56,393.94. The Department of Agriculture, in cooperation with the Territory, has definitely outlined a road-building program within the national forests; cooperative agreements have been approved and a number of projects are now under construction by the Bureau of Public Roads.

A small pulp plant was started at Port Snettisham, which will be ready for the manufacture of pulp by next spring; a preliminary sale of 100,000,000 feet of timber was made to this company.

Reservations and withdrawals.—There seem to be 347 withdrawals and reservations of public lands; many of them serve no useful purpose. The governor recommends that an interdepartmental

committee be appointed to restore lands not needed for the purposes stated in the orders of withdrawal. He also recommends the restoration of all bird reserves, particularly the Yukon Delta Bird Reserve, of approximately 20,000 square miles, an area as large as the combined area of New Hampshire, Massachusetts, and Rhode Island. The migratory bird treaty act now protects all nesting grounds and in the autumn the birds migrate, hence reserves are regarded as unnecessary.

Agriculture.—Agriculture, the success of which was so much questioned in the past, is yearly becoming more and more an established industry. The farmer in the Territory can not hope for many years to compete with the farmer of the States, but as the population increases in other pursuits, farm products will become in great demand. Already the Matanuska and Tanana districts are furnishing practically all the vegetables required for local consumption. Forage for horses and cattle is being grown, and even wheat, the maturing of which was at one time thought impossible, is through the efforts of the agricultural experiment stations now a regular crop. Fairbanks has the first flour mill to be built in the Territory, and it is expected that it will be only a few years before that district will be supplying the whole of the interior and the towns along the line of the Government railroad with flour. The average yield of wheat at Fairbanks is 19.6 bushels to the acre. The farmers there are commencing to organize for the purpose of cooperation in buying machinery and equipment. The live-stock industry has hardly progressed beyond the demands for dairy products, but eventually beef cattle will be grown in many parts of the Territory. Farming would be expedited if the provisions of the Federal farm loan act could be extended to the Territory. Farmers are experiencing difficulty in financing themselves during the time required for breaking in new land and for purchasing farming implements. The governor states that the growing of live stock should be encouraged by the loan of blooded cattle to the farmer for a period of years under regulations to insure proper care; a return to the Government to be made in kind for issuance to other stock growers. As far as funds would permit to carry out the provisions of Territorial law, an inspection of cattle was made, and 103 cows found to be infected with tuberculosis were destroyed.

Coast and Geodetic Survey.—The Coast and Geodetic Survey should receive every possible support from Congress, as no development in coastal Alaska can be undertaken without correct charts of the harbors and waterways; some of the worst wrecks have occurred in uncharted waters. Many of the present charts are merely adaptations from the works of the early explorers and navigators.

The general plan for surveys of the navigable waters is a continuation of the much-needed surveys of the commercial routes through the inside passages and along the outer coast. The Director of the Coast and Geodetic Survey spent part of the field season of 1920 in Alaska investigating the most urgent needs of the country, and is thoroughly impressed with the urgency of surveys as connected with the industrial growth of the Territory.

Aids to navigation.—Minor aids to navigation are being established at a fairly satisfactory rate, but for the larger projects, although some of them have been authorized by Congress, appropriations have not been forthcoming. Particular attention is drawn to the need of improved lights with added fog signals at Cape Spencer, Cape Hinchinbrook, and Point Retreat. These points have long been dreaded by mariners and should have proper lights and signals. Cape Spencer marks the opening from the Gulf of Alaska into Cross Sound and the inside passage, a route used by practically all vessels sailing to southwestern Alaska; particularly at the cape is a high-powered light and strong siren needed. Fogs and storms are here very prevalent and unless the cape can be seen a steamer must lie outside until clearing weather permits an entrance. At many other points along the coast a master can determine his position from soundings, but at Cross Sound there is no regularity of bottom, rendering this mode of reckoning ineffective.

Twenty new lights were established by the Lighthouse Service since June 30, 1919. Five lights were changed from fixed to flashing; and 1 gas buoy, 2 gas and bell buoys, 14 buoys of other types, and 11 beacons were established.

Washington-Alaska military telegraph system.—A great factor in the development of the Territory is the military cable, telegraph and radio systems. Mails are so slow and uncertain that almost a disproportionate use is made of telegraphic communications. The United States Signal Corps conducts a commercial telegraphic service to the main centers of population throughout Alaska. While the exact costs of operation and maintenance can not accurately be obtained, it is understood that the organization is self-supporting.

During 1919 there was transacted a total business of \$565,258.74, of which \$426,756.77 is chargeable to tolls over the system. Expenditures amounted to \$92,686.40, which included \$15,000 for purchase of radio stations, supplies for the system for the year, all repairs, maintenance, and operation. Salaries, allowances, and cost of equipment and supplies, however, are not figured in the above. There are three officers in the organization, an average of 252 enlisted men, and 48 civilians. During the summer months communication is kept up with radio stations maintained by the various companies engaged

in fisheries. The system comprises 2,676 statute miles of submarine cable and 799 statute miles of telegraph lines.

Naval communication service.—There are at present nine naval radio stations in Alaska, namely: St. Paul, St. George, Dutch Harbor, Kodiak, Seward, Cordova, Sitka, Juneau, and Ketchikan; the number of men on duty at all the stations is approximately 100, and the number of men attached to the individual station ranges from one attached to St. George to 30 men attached to Cordova.

The naval communication service handles commercial traffic to any and all points that are served by the radio stations. In many instances the radio service is in competition with the Army cable. The rates have been made the same for both the cable and radio, and this uniformity of rates makes it very easy to route the traffic via radio in case of a cable break or by cable in case of a radio breakdown.

Naval patrol.—As in prior years during the salmon fishing seasons a small naval patrol consisting of the Eagle boat 57, the sub chaser 294, and sub chaser 319, was assigned to Alaskan waters. The 57 lost her propeller on the way north, and the 310 was laid up practically the entire season on account of engine trouble, thus leaving the 294 as the only effective boat. A naval patrol has an undoubted moral effect, but is of little other use unless in constant service against fish piracy and stream fishing. To be an effective force there should be approximately 20 small ships stationed in Alaskan waters with given police powers.

In the winter season there is constant need for a ship capable of going anywhere in any weather; transportation facilities during this period are cut to the minimum, and in an emergency it often happens that no methods of travel are at hand. A ship should be provided to be available for quarantine duty, rescue and relief work, and for the use of Federal and Territorial officials.

Enforcement of prohibition.—Liquor is finding its way into the Territory from British Columbia, and distillation processes are becoming well known; bootlegging seems to be increasing as private stocks of liquor become exhausted.

The passing of the open saloon has had a most beneficial effect, and very few people would want a return to old conditions. Savings accounts have greatly increased, and families formerly neglected by the husband and father are now well cared for; but the drastic provisions of the bone-dry act have made lawbreakers of a large proportion of the population otherwise law-abiding.

The governor expresses the opinion that it would be well to extend the provisions of the Volstead Act to Alaska, particularly as applied to the use of liquor for medicinal purposes. During the epidemics of influenza doctors were frantically endeavoring to procure whisky for their patients seriously ill with pneumonia, and it is

claimed that many lives could have been saved had whisky been available during the emergency.

Law enforcement.—The governor renews his recommendations for the creation of a Territorial police force; he estimates that 150 to 200 trained men can take over the entire policing of the Territory, performing more efficient, effective, and economical duty than can the present uncorrelated services. In addition to the enforcement of law a police force would be at all times available for quarantine duty, the regulation of health and sanitation, search for lost persons, and for rescue work. Those States having police forces have found that crime has decreased and that industry has increased.

During the fiscal year, of 61 precincts having judicial officers, reports were received from 32, six of which reported no criminal cases brought before the court, while 26 reported the trial of 647 cases, with convictions obtained in 319 instances; \$36,698.50 was collected in fines and 142 jail sentences were imposed.

Many offenses against the law are reported which are impossible to investigate under the present system, and many cases brought to trial are preventable misdemeanors. To the governor's mind prevention of crime is more desirable than punishment after the commission of an offense. Ignorance of the law is the cause of a number of arraignments; a police force, in addition to its other duties, is an educational body for this class of unwitting offenders.

Alaska insane.—Under a contract with the Secretary of the Interior the legally adjudged insane of Alaska are cared for at the Morningside Hospital, near Portland, Oreg., the contractor being the Sanitarium Co.

On the expiration of the old contract, January 20, 1920, a new agreement on a sliding scale for the ensuing five-year period, became effective. The contractor had estimated that as the war had ceased, there would be a speedy return to normal prices and calculated the maintenance costs accordingly. Fortunately, there existed a clause in the agreement which would allow an increased scale when approved by the Secretary of the Interior. On recommendation from the Secretary, Congress fixed the price to be paid the contractor during the fiscal year ending June 30, 1921, at \$45 per month for each patient. The governor does not regard this as sufficient to cover proper care of patients, food, clothing, plant investment, etc., and recommends an increased payment based on maintenance costs at St. Elizabeths Hospital, the federal asylum near Washington, D. C., plus a reasonable allowance to cover investment and profit. He also recommends that a law be enacted providing that Alaskan insane patients of homicidal tendencies be admitted to St. Elizabeths Hospital, where provision is made for the special care of that class of insane persons.

On June 30, 1919, there were 203 insane in the hospital. On June 30, 1920, there were 206, an increase of 3 during the year. There were 52 patients received during the year, 10 were deported by the United States Immigration Service, 18 were discharged, 3 eloped, and 18 died.

Game and game laws.—In general, the game situation is fairly satisfactory; in some districts the game has increased and in a few others it has decreased. A warden has been placed near Mount McKinley National Park to protect the game refuge until a park appropriation is available.

By act of Congress approved May 31, 1920, making appropriation for the Agricultural Department (41 Stat., 716), jurisdiction over land fur-bearing animals was transferred from the Department of Commerce to the Department of Agriculture which had nominal jurisdiction over game animals. This action eliminates one bureau in the departmental scheme of supervision, but no control of game or fur-bearing animals from Washington can ever be effective. The people of Alaska, the governor states, demand Territorial control of game, and Congress should accord it.

Fisheries and fur-bearing animals.—The salmon fishing industry is seriously menaced, and speedy remediable action should be taken by the Government or this most important industry, normally furnishing trade to the United States in the sum of approximately \$50,000,000 annually, will be slowly obliterated. The small amount now appropriated for the protection of Alaskan fisheries is so inadequate as to be of doubtful effectiveness.

The governor finds that the cannery are becoming justly alarmed over the outlook, as are the independent fishermen. Each industry blames the other for the salmon shortage, and as a matter of fact both sides are right; it apparently being a case of everybody grabbing while the grabbing is good. The governor believes that the salmon, if properly protected and propagated, will indefinitely permit of the packing of 4,000,000 cases per year and the shipment of 10,000,000 pounds put up in other ways.

Herring packing is not flourishing as it should. Scotch and Norwegian competition, unless subjected to a protective tariff, will not allow the profitable sale of the local product in the eastern markets.

Some of the minor fishing industries show healthy increase in exports, notably in shrimps and canned clams.

New legislation covering the fisheries of Alaska is imperative; the present laws, while probably sufficient to cover the period during which they were passed, do not cover present conditions of intensive fishing by seines and fixed gear. The governor believes primarily in Territorial control of the fisheries; but if this can not be procured,

he advocates an appropriation of not less than \$300,000 per annum to enforce laws and regulations.

Fisheries statistics.—The number of persons employed in the fisheries of Alaska in 1919 was 28,534. Of these 16,326 were classed as white, 3,875 as natives, 2,770 as Chinese, 1,507 as Japanese, 1,578 as Filipinos, 1,891 as Mexicans, and 587 as miscellaneous. The total number in 1918 was 31,213, or 2,679 more than in 1919.

The total investment in the fisheries of Alaska in 1919 was \$74,181,560, of which \$66,495,171, or approximately 89 per cent, was invested in the salmon-canning industry. The investment in 1919 was greater than in 1918 by \$430,771. Of the 1919 investment approximately \$37,573,000 was in the southeastern section, \$14,651,000 in the central part, and \$21,957,000 in western Alaska.

The total value of the fishery products in 1919, exclusive of aquatic furs, was \$50,282,067, a decrease of \$8,872,792 from the preceding year, when they were valued at \$59,154,859.

In 1919 the total number of salmon taken was 58,172,665. The take by species was as follows: Coho, or silver, 2,429,846; chum, or keta, 12,179,120; humpback, or pink, 25,894,976; king, or spring, 967,992; and red, or sockeye, 16,700,731. The total take in 1918 was 101,454,688, or 43,282,023 greater than in 1919; there was a decreased catch of all species except kings in 1919.

The investment in the salmon-canning industry amounted to \$66,495,171, of which \$33,741,891 was in southeast Alaska, \$12,897,947 was in central Alaska, and \$19,855,333 in western Alaska. The total investment in 1918 was \$63,901,397, or \$2,593,774 less than in 1919. There was a larger investment in the salmon-canning industry in the southeastern and central districts, but a smaller in the western district than in 1918. The number of persons engaged in 1919 was 25,499, or 1,003 less than the number employed in 1918. The output of canned salmon in 1919 consisted of 4,583,688 cases, valued at \$43,265,349, as compared with 6,605,835 cases in 1918, valued at \$51,041,949. The pack and value according to species in 1919 were as follows: Coho, or silver, 232,870 cases, valued at \$2,624,826; chum, or keta, 1,365,563 cases, valued at \$9,320,456; humpback, or pink, 1,611,608 cases, valued at \$13,469,046; king, or spring, 95,986 cases, valued at \$1,261,057; red, or sockeye, 1,277,661 cases, valued at \$16,589,964. In 1919 there were operated in the salmon industry 134 canneries, as compared with 135 in 1918.

The herring industry suffered a decided setback in 1919, due in part to the large eastern markets being supplied with European herring.

The investment in the herring fishery in 1919 was \$900,572, a decrease of more than 50 per cent from the amount reported in 1918.

The number of persons employed was 427, and the value of products was \$1,676,170. The value of the output in 1918 was \$1,819,538.

The halibut industry was again second to the herring fishery in value of output. In 1919 the investment in the halibut industry was \$1,979,457. In 1918 it was \$2,594,292, or greater by \$614,835. The number of persons employed in 1919 was 867. The total production of halibut credited to the Territory was 14,278,791 pounds, valued at \$1,550,605. Including the catch of halibut delivered by American vessels at Canadian ports, a total of approximately 26,000,000 pounds of halibut was obtained by American vessels in 1919.

The cod fishery showed a considerable decline in 1919 from the production of previous years. Reasons given for this were lack of transportation and inability to compete with cod imported from Japan. The investment in the cod fishery in 1919 was \$1,286,075, which was \$14,957 greater than in 1918. The number of persons employed was 702, as against 697 in 1918. The total production of prepared cod amounted to 10,893,312 pounds, valued at \$852,990.

Commercial killing of fur seals was continued on the Pribilof Islands in the season 1919; there were taken on St. Paul Island 24,053 seal skins and on St. George Island 3,768, a total of 27,821 skins for the calendar year 1919. Two sales of dressed, dyed, and machined fur-seal skins from the Pribilof Islands were held in St. Louis in 1919. On April 28 the number of skins sold was 10,102, and the total price bid was \$674,491, the average per skin being \$66.77. At the sale on September 10 the number of skins disposed of was 9,055 and the total price bid was \$827,112.50, an average of \$91.34 per skin. The total number of skins sold during the year was 19,157, and the total amount bid at the two sales was \$1,501,603.50.

The seal census shows the herd to consist of approximately 525,000 animals in the Pribilof rookeries.

Herds of blue foxes are also maintained on the Pribilof Islands by the Bureau of Fisheries. The pelts taken in the season of 1918-19, consisting of 119 blue and 25 white pelts on St. Paul Island and 548 blue and 5 white pelts on St. George Island, a total of 667 blues and 30 whites were, with the exception of 2 blues retained for exhibition at Washington, sold at St. Louis on September 10, 1919. The 665 blues brought \$130,274.50, an average of \$195.90 per skin, and the 30 whites brought \$1,660, an average of \$55.33. In 1919, the value of furs shipped from Alaska, including those from the Pribilof Islands, was \$3,021,182, as compared with \$2,288,170. The greater part of this increase is in the higher price of furs in the season of 1919.

Natives of Alaska.—There is no doubt, the governor states, that the natives of Alaska can be so developed in education and in industry as to become a great factor in the economic life of the Territory. In

southeastern Alaska is found the greatest progress. There are many natives of full or mixed blood who have assumed the responsibilities of citizenship and who are able to compete on equal terms with their white neighbors. Among them are found clergymen, teachers, merchants, and navigators. They own their own homes and fishing vessels. Some of them are comparatively wealthy. In certain towns, such as Metlakatla, Klawock, and Hydaberg the land they occupy is set aside by proclamation for their sole use; they can in no way be classed as reservation Indians. They are free to come or go as they wish; they are not supported by the Government; the land is simply held for their exclusive occupancy.

There are three educational agencies for native instruction in Alaska—the Bureau of Education of the Department of the Interior, the missionaries, and the Territory of Alaska, the latter being an unwilling contributor, but forced to take steps in this direction in the interest of the public welfare. As a matter of equity the Government should extend its excellent system of education to all full-blooded natives and those of mixed blood, as the drain on the Territorial treasury is very great.

Statistics compiled by the Territorial commissioner of education show that 930 natives of full or mixed blood are now being educated by the Territory at an approximate yearly cost of \$68,000. During the year the field force of the Bureau of Education in Alaska consisted of 6 superintendents, 133 teachers, 9 physicians, and 13 nurses. Sixty-seven schools were maintained.

As the result of the epidemics of influenza among the natives of northern and western Alaska during the autumn of 1918 and the spring of 1919 about 250 children were left orphans. In the Nome region it was found possible to distribute the orphans among Eskimo families, but in the Bristol Bay and Cook Inlet districts it was necessary for the bureau to assume their entire care in orphanages which were erected at Kanakanak and Tyonek.

The appropriation of \$80,000 for medical relief was expended in maintaining hospitals at Juneau, Kanakanak, Akiak, Nulato, and Kotzebue; 9 physicians and 13 nurses were employed. To assist them in providing medical relief, each teacher is provided with a standard medical equipment with which to attend to ordinary ailments and less serious injuries.

Reindeer.—The approximate number of reindeer in Alaska is estimated at 200,000. The magnitude and value of the industry have resulted in the making by Congress of an appropriation to enable the Bureau of Biological Survey, Department of Agriculture, in cooperation with the Bureau of Education, to make investigations, experiments, and demonstrations for the improvement of the reindeer industry in Alaska.

Schools.—The public schools of Alaska are under the direction of the Territorial board of education, with the commissioner of education, Juneau, Alaska, as executive head. They are maintained for white children and for children of mixed blood leading a civilized life, and are administered under both Federal and Territorial laws.

Schools in incorporated towns and incorporated districts.—There are 14 schools in incorporated towns and 2 in incorporated school districts supported in part by Territorial appropriation. The averages for the 16 schools are as follows: Average number of teachers, 6.12, with an average yearly salary of \$1,412.13 per teacher; average enrollment, 128.81; average daily attendance, 102.17; average cost of maintenance, exclusive of teachers' salaries, \$4,070.57. The average cost per pupil was \$98.75, as compared with \$87.42 for the previous year.

Schools outside of incorporated towns.—For the year 1919-20 schools were maintained in 52 districts outside of incorporated towns and incorporated school districts. The 52 schools employed 65 teachers and had an enrollment of 1,357, as compared with 1,209 the previous year. The average number of pupils per school was 26 as compared with 25.7 the previous year. A total of \$126,519.86 was expended for maintenance, at an average cost of \$2,433.07 per school, as compared with \$2,332.99 for the previous year. The average cost per pupil was \$93.23 as compared with \$90.69 for the previous year. Citizenship night schools for adults are also maintained.

Territorial finances.—The revenues derived by the Federal Government from business and trade licenses outside of incorporated towns are collected by the clerks of the district courts, deposited to the credit of the Treasurer of the United States and by him credited to the Alaska fund, under the act of Congress approved January 27, 1905. Sixty-five per cent of the money paid into this fund is appropriated for the construction and repair of roads and trails outside of incorporated towns and spent under the direction of the Board of Alaska Road Commissioners, 25 per cent for the maintenance of schools outside of incorporated towns, and 10 per cent for the relief of indigents, disbursed by the Federal judges, under the act of Congress approved March 3, 1913. The total cash collection for the fiscal year 1920 was \$185,986.18.

The Territory has its own fiscal system, controlled by laws enacted by the Territorial legislature, which is entirely separate and apart from the revenues received by the Federal Government from business and trade licenses and which are covered into and disbursed from the Alaska fund in the Federal Treasury.

The total bank deposits in the Territory in 15 Territorial and three national banks were \$8,500,781.15.

Public buildings.—There is great need for a fireproof public building at the capital. The various Federal offices are scattered all over town, largely in frame structures, which may at any moment be destroyed by fire, together with all the valuable records. The offices should all be grouped together under one roof, not only as a precaution against fire, but to facilitate business. The rents now being paid would nearly pay interest on investment.

Office of the governor.—The last appropriation act allowed an increase in the salary of the secretary of \$250 per annum and for general maintenance and contingent expenses including salary of janitor, etc., an increase of \$1,250, bringing the total to \$7,500, which equals the prewar allowance, cut during the war to \$6,000. This will not cover expenses even though the greatest economy is exercised. Coal has risen \$5 per ton in the past three years with a further increase threatened, and everything else is in proportion, including transportation and expense of travel. The office of the governor should not be expected to be conducted on the same allowance as before the war.

In conclusion, the governor submits the following recommendations:

Enactment of the Alaska development board bill.

Enactment of the transportation-in-Alaska bill.

Enactment of the bill placing a tax on manufactured gold and for the payment of a premium therefrom to producers.

Amendment of organic act to grant to Alaska full Territorial powers of legislation.

Transfer to Territory of jurisdiction over fish, game, and land fur-bearing animals.

Transfer of abandoned marine barracks at Sitka to Territory.

Amendment of coal-leasing law, exempting lessees from the payment of rentals and royalties for the first five years.

Establishment of a Federal police force for Alaska.

Extension of Federal farm-loan act to Alaska.

Extension of Federal-aid road act to Alaska.

Transfer of the Alaska fund from the Federal to the Territorial treasury.

Authorization, under appropriations already made, for the construction of Federal buildings at the capital and at Cordova.

Transfer to the Territory of the net proceeds of sales of timber from the national forests.

Territorial participation in the net proceeds of sales of seal and fox skins from the Pribiloff Islands.

Consolidation of the various branches of the General Land Office in Alaska and the creation of the office of secretary of Alaska separate from that of the surveyor general.

Appropriations for the building of feeder wagon roads to the Government railroad.

Increased appropriations for the Bureau of Fisheries, and the establishment of an agent in Alaska who is authorized to speak for the bureau.

Enlarged activities of the Bureau of Mines.

Restoration of prewar appropriation to the United States Geological Survey for work in Alaska.

Improvement of Wrangell Narrows, Dry Straits, the construction of a breakwater at Wrangell, and the construction of a Government dock at Juneau.

Improvement of the mail service and the restoration of the mail contract system.

Incarceration of homicidal insane of Alaska at St. Elizabeths Hospital.

Granting of an appropriation of \$5,000 to establish vocational training for the Alaskan insane patients at the Morningside Hospital, Portland, Oreg.

Restoration to the public domain of useless withdrawals and reserves.

Establishment of a forest district for Alaska.

Appropriation for the Mount McKinley National Park.

Increased appropriations for lighthouses, coast surveys, Bureau of Education, game wardens, for the suppression of liquor traffic, office of the governor.

Authorization and increased appropriations for the Alaska Road Commission enabling it to inaugurate a 10-year road-building program.

Enlarged telegraph service.

Assignment of Navy or Coast Guard ship to continuous duty in Alaska.

Loan of blooded stock by Department of Agriculture to farmers.

Detail of public health officer to Alaska as commissioner of health.

Modifications of forestry regulations covering leases of timber to pulp and paper manufacturers.

HAWAII.

The report of the governor of Hawaii shows that general prosperity has extended over the Territory throughout the year, due largely to the high price of sugar. Sugar and pineapples continue to be the main crops of the islands. The yield of sugar for the year 1920 is estimated at 568,671 tons and that of pineapples at 6,000,000 cases. Already the ports of the Territory have had evidence of the increased commerce which it was expected would develop on the Pacific Ocean at the close of the World War. The gross tonnage of

all vessels arriving during the year was 5,430,976, or an increase of 1,970,771 tons. The imports to the islands for the year ended March 31, 1920, amounted to \$63,283,647 and exports to \$104,779,804. Of the imports, those received from the mainland amounted to \$53,669,174 and those from foreign countries to \$9,614,473; of the exports, the shipments to the mainland (United States) totaled \$101,194,733 and to foreign countries \$3,585,071. The prosperity of the islands in the last year is indicated by the statistics for the internal revenue, which show that the receipts of the Federal Government from that source were \$11,927,545.81, the greatest in the history of the Hawaiian office, being an increase of more than 100 per cent over last year's receipts, which aggregated \$6,095,612.62. The customs receipts were \$1,172,394.04, an increase of \$314,136.04 over last year. Savings bank deposits have also shown tremendous increases. For the year just closed they total \$15,807,778.11 as against \$10,450,846.55, an increase of approximately 50 per cent over the year 1919. The assessed valuation of real and personal property in the entire Territory is \$287,206,792, which is greater by \$36,482,446 than last year.

The Territorial legislature at its 1919 session adopted a resolution authorizing a Territorial commission to proceed to Washington in 1920 with a view to having Congress amend the Territorial organic act so that land matters could be handled in such a way as to do justice not only to those applying for the land but to the taxpayers of the Territory. This commission, consisting of the governor, Hon. C. J. McCarthy, the attorney general, Hon. Harry Irwin, Senators R. W. Shingle and John H. Wise, and Representatives William T. Rawlins and Henry J. Lyman, arrived in Washington in January of 1920, and during its stay was accorded numerous hearings by the House Committee on the Territories. Thereafter a bill was drafted embodying the legislative changes which the congressional committee believed should be made. This bill, known as House bill 13500, entitled "An act to amend an act entitled 'An act to provide a Government for the Territory of Hawaii,' approved April 30, 1900, as amended, to establish an Hawaiian Homes Commission, and for other purposes," passed the House of Representatives May 22, 1920, was considered in the Senate May 24, 1920, and reported by the Senate Committee on Territories without amendment, and is now pending in the Senate. The act provides, among other things, for a maximum amount of land to be given the Hawaiians, the title always to remain with the Territory and the Territory to finance them within certain limits. The governor states that should this bill become a law the revenues of the Territory will be greatly increased, but should it fail to be enacted it would be necessary to increase the local taxes in order to carry on the Territorial government.

On February 1, 1920, several thousand plantation laborers on the island of Oahu went on strike, claiming dissatisfaction with the wage system existing. Among the reasons advanced for the strike were the following: That the laborer should be entitled to the bonus if he worked but 15 days in a month; that instead of being paid as a bonus the pay should be as wages; that a large percentage of the bonus should be paid each month and less held back until the end of the year or that all of the bonus should be paid each month.

The plantations have had a basic rate wage for the common field laborer, who works by the month. When the price of sugar began to rise, the plantations decided they would share the profit with the laborer and voluntarily agreed to give a bonus. The basic wage was predicated on sugar selling at 4 cents a pound, the bonus to be paid on the percentage any increase over this amount bore to the basic price. The bonus for the calendar year 1919 was approximately 90 per cent, but as the price of sugar rapidly increased early in 1920, the bonus for the first six months has amounted to more than 500 per cent. One of the provisions of the bonus system was that the laborer should stay on any one plantation for a year and work at least 20 days out of each month. A certain amount of the bonus was paid each month and a portion kept back until the end of the year to guarantee the laborer remaining for that length of time.

This bonus system has had a very disastrous effect in many lines of activity throughout the Territory. While the sugar plantations could afford to pay the bonus, as their product was selling at an extremely high price, people not in the sugar business found it absolutely impossible to pay corresponding salaries or wages, with the result that many of their men who were formerly satisfied quit their work.

The strike lasted until June 30, 1920, when the laborers decided to return to work on the same wage conditions as when they had left.

As a part of the Americanization program the Territory has always endeavored to carry on there was introduced in the 1919 session of the legislature a bill for the control of foreign language schools. This bill simply provided that the teachers of the private schools should be able to speak, read, and write the English language and that they should be versed in American history and have a knowledge of forms of American government. Protests, however, against the passage of the bill were made by one nationality that maintains a large number of private schools attended by children of that race before and after the public school sessions of each day. The bill was regarded as reasonable and as in public schools of the Territory the children of all races are treated exactly alike and as most of them spend their lives in the Territory with voting powers, the governor

is of the opinion that it is absolutely necessary that the children be taught the fundamentals of American government. He expresses the hope that the next legislature will enact legislation which will carry out the object sought—the thorough Americanization of the islands.

The Geological Survey sent several experts to the Territory to carry on a thorough investigation of possible sources of underground water. Considering the large rainfall in the islands and the comparatively small run-off, it seems certain that there is a large supply of underground water which, if located, will prove of great value to the Territory in irrigating large areas of land that are too dry at present to grow valuable crops. The Survey also continued the topographic survey of the islands which was begun several years ago, but which was stopped after the islands of Kauai and Oahu and a part of Hawaii had been surveyed. The work has been taken up again on Hawaii and will be extended later to the island of Maui.

Realization of the great part Hawaii is destined to play in the rapidly developing commerce of the Pacific Ocean has been a stimulus to action toward the enlargement and improvement of Honolulu harbor and other harbors of the islands.

At present the territorial government is opening up at its own expense the Kewalo basin, which fronts on the city and which promises in time to be as large or larger than the present Honolulu harbor. It is earnestly desired to secure Sand Island from the Federal Government as a part of the extension program. The island is of no use to the Federal Government, and the Secretary of War has expressed his willingness to have it turned over to the Territory. It is intended that a bill shall be introduced in the next Congress providing for this change.

Commerce has increased so greatly at Hilo that it has been found necessary to build another wharf there, and the treasurer is now attempting to dispose of bonds to finance this project.

The island of Maui, second largest of the group, is to have a wharf at Lahaine at which deep-seagoing vessels may berth. The port of Kahului has also been selected by the board of harbor commissioners for a wharf at which deep-seagoing vessels may be berthed. It is confidently expected that the next legislature will appropriate funds for this latter proposition.

During the year the great Government dry dock at Pearl Harbor was opened, the Secretary of the Navy announcing at the opening ceremonies that it would be used for the docking and repair of commercial as well as naval vessels.

The Interisland Steam Navigation Co. has almost completed its new floating dry dock in Honolulu harbor. This dock will have a lifting capacity of 8,500 tons. The same company maintains in

Honolulu two automatic coaling plants which can give quick service to vessels calling for bunker coal.

A number of large oil companies maintain storage plants in Honolulu which are connected to all of the Territorial wharves by pipe lines, so that any vessel may secure its oil from any wharf in the port. Similar service is provided at the harbor of Hilo, allowing for the quick dispatch of vessels calling for fuel oil.

The Territory, the governor states, has been signally honored this year in the coming of a large number of distinguished persons to visit its shores. In August, 1919, the Secretary of the Navy, with Mrs. Daniels, arrived to take part in the opening of the great naval dry dock at Pearl Harbor. In October, the Territory had the honor of entertaining for a few days Admiral of the Fleet Viscount Jellicoe, with Mrs. Jellicoe and the officers of the H. M. S. *New Zealand*. In April, during the centennial celebration of the landing in Hawaii of the first Christian missionaries, His Royal Highness the Prince of Wales was a guest for two days, adding much to the pleasantness of the occasion.

Imports and exports.—The imports for the fiscal year ended March 31, 1920, were \$63,283,647, as against \$50,743,899 for the prior year. The exports for the year ended March 31, 1920, were \$104,799,804, as against \$88,250,021 for the previous year. The following table shows imports and exports, by countries, for 1919 and 1920.

Imports and exports, by countries.¹

Countries.	Imports.		Exports.	
	1919	1920	1919	1920
Australia.....	\$138,289	\$472,683	\$36,141	\$12,827
Other British Oceania.....	67,914	70,472	106,720	94,286
British India.....	1,372,469	1,534,924		708
Canada.....	431,760	141,730	4,975,849	340,104
Chile.....	871,328	1,353,012		
France.....	1,822	8,263		
Germany.....	1,535			
Hongkong.....	465,209	769,901	7,485	15,011
Japan.....	4,558,499	4,774,223	548,758	323,847
United Kingdom.....	47,095	80,655	1,114	928,372
Other foreign.....	366,505	408,610	164,840	1,869,921
Total foreign.....	8,322,425	9,614,473	4,840,907	3,585,071
United States.....	42,421,474	53,669,174	82,409,114	101,194,733
Grand total.....	50,743,899	63,283,647	88,250,021	104,779,804

¹ For fiscal years ending Mar. 31.

The following table shows the domestic exports by articles for the years 1919 and 1920:

Domestic exports by articles, fiscal years 1919 and 1920.¹

Articles.	United States, 1920.		Foreign, 1920.	
	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>	
Sugar.....	1,070,124,077	\$78,589,467	389,395	\$37,292
Coffee, raw.....	2,051,311	521,316	708,735	211,077
Fruits and nuts ²		18,509,028		1,294,923
Rice.....	2,394,426	238,218	86,400	8,386
Hides.....	1,497,786	376,227		
Other.....		2,827,038		2,002,756
Total.....		101,061,294		3,554,384

Articles.	Total, 1920.		Total, 1919.	
	Quantity.	Value.	Quantity.	Value.
	<i>Pounds.</i>		<i>Pounds.</i>	
Sugar.....	1,070,513,472	\$78,626,759	1,167,594,808	\$68,497,289
Coffee, raw.....	2,760,046	732,393	7,639,220	1,184,148
Fruits and nuts ²		19,803,951		12,116,344
Rice.....	2,480,826	246,554		131,950
Hides.....	1,497,786	376,227		337,611
Other.....		4,829,704		5,623,863
Total.....		104,615,678		87,801,225

¹ For fiscal years ending Mar. 31.² Mostly pineapples.

Customs and internal revenue receipts.—Customs receipts for the year were \$1,172,394.04, as against \$858,258.25 for the previous year. The total customs receipts since the organization of the Territorial government in 1900 aggregate \$26,000,277.87. Internal revenue receipts were \$11,927,545.81, an increase over the previous year from this source of \$6,095,612.72.

Territorial finances.—Local governments in Hawaii were first established July 1, 1905, the Territory being divided into four counties. On January 1, 1909, the county comprising the island of Oahu was converted into a city and county known as the city and county of Honolulu, with a mayor. The leper settlement on the island of Molokai forms a fifth county, Kalawao, under the control of the territorial board of health. The income of the various counties aggregated \$5,468,947.61, as against \$4,692,859.63 for the prior fiscal year. The assessment of property, real and personal, in the Territory during the year aggregated \$287,006,792, as against \$250,524,346 for the prior year. The total revenues collected by the Territory aggregated \$10,925,406.97 and the total expenditures aggregated \$10,949,897.38. The current cash balance on hand June 30, 1919, was \$442,609.95 and the current cash balance on hand June 30, 1920, was \$506,334.53. The treasury cash balance, all accounts, at the end of the fiscal year 1917 was \$2,077,639.29; 1918, \$2,647,597.21; 1919, \$2,365,979.35; and 1920, \$3,370,647.82.

Bonded indebtedness.—By the provisions of section 55 of the act of April 30, 1900 (31 Stat., 114), as amended by the act of May 27, 1910 (36 Stat., 443), the Territory is permitted to issue bonds not to exceed 7 per cent of the total assessed value of the property of the Territory, but not more than 1 per cent in any one year. The completed assessment of real and personal property for 1919 aggregated \$250,524,346, and that for the fiscal year 1920 aggregated \$287,006,792, and the borrowing capacity is therefore over \$17,000,000. The total bonded debt on July 1, 1919, was \$9,194,000, which was increased by the sale of \$200,000 of the July 1, 1919, issue of 5 per cent Memorial Park bonds, and \$1,500,000 of the September 15, 1919, issue of 4½ per cent public improvement bonds.

Territorial bonded indebtedness, June 30, 1920.

Date of issue.	Term of years.	Inter-est.	Sale price.	Per-centage basis.	Aggregate out-standing.	Date due.	Where sold.
		<i>Per cent.</i>					
Oct. 4, 1905	5-15	4	\$101.375	3.70	\$270,000	Oct. 4, 1920	Honolulu.
Jan. 2, 1906	5-15	3½	98.125	3.66	750,000	Jan. 2, 1921	New York.
Oct. 1, 1907	5-15	2½	98.150	3.66	294,000	Oct. 1, 1922	Honolulu.
Oct. 1, 1909	5-15	3½	98.250	3.65	200,000	Oct. 1, 1924	Do.
Aug. 1, 1911	20-30	4	101.5875	3.88	1,500,000	Aug. 1, 1941	New York.
Sept. 3, 1912	20-30	4	100.5887	3.985	1,500,000	Sept. 3, 1942	Do.
Sept. 15, 1914	20-30	4	100.01	4.00	1,430,000	Sept. 15, 1944	New York and Honolulu.
May 15, 1916	20-30	4	100.00	4.00	1,750,000	May 15, 1946	Do.
Aug. 1, 1917	20-30	4	98.04	4.08	1,500,000	Aug. 1, 1947	Do.
July 1, 1919	5	5	100.50	4.975	200,000	July 1, 1924	Honolulu.
Sept. 15, 1919	20-30	4½	102.814	4.377	1,500,000	Sept. 15, 1949	New York.
Total.....	.....	.....	.....	.....	10,894,000		

Bank deposits and insurance.—Twenty-six banks were in operation during the year. These were distributed as follows: Eight in Honolulu, two at Waialua, and one each at Schofield and Waipahu, on the island of Oahu; three at Hilo, two at North Kona, and one each at Kau, Honokaa, and North Kohala, on the island of Hawaii; one each at Wailuku, Kahului, Paia, and Lahaina, on the island of Maui; and one each at Lihue and Waimea, on the island of Kauai. Three are national banks, namely, one at Honolulu, one at Schofield, and one on the island of Maui. One of the banks is solely a savings bank, one is solely commercial, and the remainder are both commercial and savings banks.

Bank deposits at the end of the year amounted to \$52,783,114.04, of which amount \$36,975,335.93 were commercial deposits and the remainder, \$15,807,778.11, were savings deposits.

The savings accounts, by races, were as follows: Japanese, 12.47; Chinese, 8.56; Hawaiians, 5.15; Portuguese, 15.08; all others, 58.74.

Fire insurance premiums during the year 1919 amounted to \$1,081,372.98 and fire losses to \$90,154.84; marine insurance premiums amounted to \$572,458.25 and losses \$96,271.94. Life insurance writ-

ten was valued at \$6,144,756. The premiums paid thereon amounted to \$265,577.61, renewal of premiums, \$1,227,992.74, and the losses paid aggregate \$520,827.74.

Corporations.—During the year 87 corporations were created and 36 dissolved, as follows: Created, mercantile 68, dissolved 29; agricultural, created 5, dissolved 6; banking, created 2, dissolved 1; savings and loans, created 4; eleemosynary, created 7; steamship 1; leaving at the close of the year 904 domestic corporations, an increase of 51 in all. The total capitalization of domestic corporations other than eleemosynary, etc., is \$192,965,838, an increase of \$17,289,285, or 9.84 per cent for the year. Foreign corporations to the number of 155, as compared with 152 of the preceding year, are authorized to do business in the Territory. The classes, number, and capitalization of the domestic corporations now in existence incorporated before and after the transfer of sovereignty to the United States are as follows:

Hawaiian corporations.

Class.	Number.			Capital.		
	Incorporated before Aug. 12, 1898.	Incorporated after Aug. 12, 1898.	Total.	Incorporated before Aug. 12, 1898.	Incorporated after Aug. 12, 1898.	Total.
Agricultural.....	45	109	154	\$48,866,750	\$38,010,015	\$86,876,765
Mercantile.....	36	478	514	16,711,125	63,575,988	80,287,113
Railroad.....	5	4	9	7,370,000	7,139,990	14,509,990
Street car.....		2	2		1,950,000	1,950,000
Steamship.....	1	2	3	3,000,000	200,000	3,200,000
Bank.....	1	8	9	600,000	2,850,000	3,450,000
Savings and loan.....		19	19		1,036,000	1,036,000
Trust.....	1	6	7	500,000	900,000	1,400,000
Insurance.....		2	2		250,000	250,000
Eleemosynary.....	34	151	185			
Total.....	123	781	904	77,047,875	115,917,963	192,965,838

Public lands.—The following table shows the total area of Government lands and their estimated valuation as of June 30, 1920:

Public lands of the Territory of Hawaii as of June 30, 1920.

Classification.	Area.	Total area.	Total valuation.
	<i>Acres.</i>	<i>Acres.</i>	
Agricultural lands.....		43,929.32	\$3,882,764.75
Cane lands.....	25,659.19		
Other agricultural lands.....	16,147.13		
Rice and taro lands.....	2,123.00		
Fish ponds, etc.....		358.84	14,220.00
Net homestead area.....		30,090.44	954,723.43
Homesteads sold, amount unpaid.....	23,768.95		
Homesteads opened, untaken.....	6,321.49		
Homesteads, exchanges and reserves.....		1,887.62	108,378.00
Pastoral lands (not cultivatable).....		458,179.94	1,326,484.94
Total saleable lands.....		534,446.16	6,286,571.12
Total forest lands.....		592,958.00	2,786,084.69
Forest lands.....	215,085.35		
Forest reserves.....	377,872.65		
Total area of lands of value.....		1,127,404.16	
Total area of lands of no value.....		507,126.69	
Total public lands.....		1,634,530.85	9,072,655.81

Homesteads.—There were taken up during the year 168 homestead lots covering an area of 2,724,071 acres, at valuations aggregating \$134,937.21, or \$49.5 per acre on the average. The homesteads taken averaged 16.2 acres each. They were taken by different nationalities as follows: Hawaiians, 84; Portuguese, 40; Americans, 10; Chinese, 22; Japanese, 7; others, 5. To enable homesteaders to obtain homesteads of suitable sizes for their needs they are given the option of taking one or two, or in some cases more lots. There were taken under special homestead agreements 122 lots, under certificates of occupation, 12; under right-of-purchase leases, 13; under cash freehold agreements, 2; and homestead leases, 19.

During the year 247 homestead lots were surrendered or forfeited, covering an area of 3,663.608 acres, valued at \$39,478.12. There were 54 transfers of homestead lots, an area of 61,057.155 acres valued at \$39,057.89. A total of 183 planting agreements, representing 5,576.05 acres, were signed.

Five land and water licenses were issued, giving a total annual rental of \$25,887.80. Public lands in the Territory may be transferred from the Territory for the uses and purposes of the United States by order of the President.

The Territorial public lands are under the Territorial land department unless transferred by order of the governor for special purposes. The following transfers were made during the year in the form of executive orders:

July 25, 1919: For enlarging a cross drain crossing King Street at Government remnant near Liliha Street, Honolulu, 755 square feet.

August 8, 1919: For cemetery purposes, to be known as the Honokaa Cemetery lot, Paalaea, Hamakua, Hawaii, 0.50 acre.

August 12, 1919: For a public park, to be known as Wailoa River Park, at Waiakae-kai, South Hilo, Hawaii, 1.07 acres.

August 30, 1919: For use by the Kilauea Council of the Boy Scouts of America, for Boy Scout and camping purposes, 64.24 acres.

October 16, 1919: For use by the Father Louis Boys' Home, Hilo, Hawaii, 42.09 acres.

October 30, 1919: For a playground for the Kamohilili School, Honolulu, 15,830 square feet.

November 10, 1919: For a public park, to be known as Puu Ka Pele Park, at Waiimea district, Kauai, 415 acres more or less.

January 8, 1920: For addition to the fumigating house lot of the board of agriculture and forestry, Honolulu, 3,656 square feet.

January 22, 1920: For a public park at Pupukea-Paumalu beach lots, Koolauloa, Oahu, 34,890 square feet.

May 17, 1920: For a memorial park at Honolulu, 6.4 acres.

June 22, 1920: For a farm colony for the use by and support of the home for feeble-minded persons, at Waimano, Ewa, Oahu, 612.13 acres.

Farm Loan Board.—The first year of operation of the Farm Loan Board of Hawaii, created by Act No. 225 of the 1919 legislature, has clearly demonstrated the benefits of such a system. This board is

composed of the attorney general, the commissioner of public lands, and the treasurer of the Territory, with an executive secretary. The subagents of the land department, the tax assessors, and deputy tax assessors throughout the Territory are agents of the board as provided by the act.

Loans are made at 6 per cent, amounting to not more than \$3,000 or less than \$100 in any one case. The whole amount to be loaned is limited during the first biennial period to \$300,000. Every effort has been made to give the borrower the advantage of any savings or conveniences possible. The search of title and records has been done by the secretary without expense to the borrower and the forms have been made as short as is consistent with good business usage in order to reduce the recording cost. Time for payments is so arranged as to accommodate the borrower. Interest is charged only for the actual time each amount paid out on the borrower's account is outstanding. A number of mortgages have been taken up by the board, in nearly all cases at a reduced rate of interest. Some rates have been discovered as high as 10 and 12 per cent, under which it is almost impossible for the farmer to get free from debt. The help given by the board and its agents in getting the farmer's business in proper order, in considering his plans and advising him as to agricultural projects has been widespread and meets a real need. It has been possible in many cases to place the farmer in touch with the experiment stations, and with financial assistance.

Experience has shown that the subagents of the public lands department are well qualified to carry on the work of agents for the farm loan board because of their intimate knowledge of the lands, land values, and the persons holding Government lands under lease or agreement. They are constantly in touch with the farmers of their various districts. The tax assessors in the various localities are also well equipped to render valuable aid.

The number of loans completed to June 30, 1920, was 165, amounting to \$214,785.90.

Population, immigration, and labor.—The population of Hawaii on January 1, 1920, as shown by the Fourteenth Census of the United States, was 255,912. Compared with a population of 191,909 in 1910, this represents an increase during the 10 years of 64,003, or 33.4 per cent.

The first census of the Hawaiian Islands was taken in 1832 and was followed by censuses in 1836, 1850, 1853, and 1860. These were very simple and rudimentary in character. There was no provision for taking a census at regular periods until 1865, when the legislative assembly made it the duty of the board of education to make a complete census of the Kingdom every sixth year, counting from the

year 1860. These were taken until 1896, and in 1900 the first Federal census was taken.

Population of Hawaii, 1832 to 1920.

Year.	Population.	Year.	Population.
1920.....	255,912	1873.....	56,897
1910.....	191,909	1866.....	62,959
1900.....	154,001	1860.....	69,800
1896.....	109,020	1853.....	73,138
1890.....	89,990	1850.....	84,165
1884.....	80,578	1836.....	108,579
1878.....	57,985	1832.....	130,312

The Territory of Hawaii is an archipelago of nine inhabited islands, Hawaii, Maui, Oahu, Kauai, Molokai, Lanai, Niihau, Kahoolawe and Midway, besides a number of small uninhabited islands. The island of Hawaii is the largest and was formerly the most important, and has thus given its name to the group.

The population of Hawaii by islands is as follows: Hawaii, 64,895; Kahoolawe, 3; Kauai, 29,247; Lanai, 185; Maui, 36,080; Midway, 31; Molokai, 1,784; Niihau, 191; Oahu, 123,496.

Hawaii is divided into five counties, one of which (Hawaii) is co-extensive with the island of the same name, and Honolulu, the largest county, comprises the two islands of Oahu and Midway. The city proper, of Honolulu, has a population of 83,237, according to the Federal census; Hilo, island of Hawaii, has a population of 10,431.

Area and population of counties, 1920.

County.	Area, square miles.	Population.		Per cent increase since 1910.
		Total.	Per square mile.	
Hawaii.....	4,015	64,895	16.2	17.2
Honolulu.....	600	123,527	205.9	50.6
Kalawao.....	11	667	60.6	-15.0
Kauai.....	641	29,438	45.9	22.9
Maui.....	1,182	37,385	31.6	25.6

¹ Includes islands of Maui, Kahoolawe, Lanai, and all of Molokai except Kalawao.

From all the data and information obtainable, the population of the Territory is estimated to be 260,300 as of June 30, 1920, an increase of 4,388 since the census of January 1, 1920, taken by the Federal Government.

Estimated population, 1920, by nationality.

American, British, German, and Russian.....	25,000
Chinese	22,000
Filipino	23,400
Hawaiian	22,000
Japanese	113,500

Korean	5, 200
Asiatic Hawaiian.....	6, 100
Portuguese.....	24, 800
Caucasian Hawaiian.....	10, 800
Porto Rican.....	5, 300
Spanish.....	1, 000
Others	600
Total	280, 300

The number of births during the year were 10,165, as against 9,164 for the previous year. The birth rate per 1,000 population was 39.05, as compared with 34.76 for the preceding year. The total number of deaths was 4,564 as against 4,051 the previous year, giving an annual death rate of 17.53 per thousand of population. In the city of Honolulu 1,797 deaths occurred, or 296 more than in the preceding period, giving a death rate of 21.21 per thousand of population. In Hilo there were 255, a decrease of 11 as compared with the previous year, the death rate being 23.94.

The total number of steerage arrivals was 8,178, as against 7,435 for the previous year. The number of departures from the islands was 8,709, as against 7,401 for the prior year, divided as follows: Chinese, 650; Japanese, 5,931; Filipinos, 1,309; Koreans, 33; Porto Ricans, 14; Portuguese, 111; Spanish, 136; Russians, 13; all others, 512.

Education.—The most important educational event of the year was the survey and report by a Federal commission covering education in Hawaii. Part 1 of this report has been received and widely distributed, and the findings and recommendations therein have received general publicity through the press. Several recommendations have already been put into effect, and it is likely that others will be adopted within the next few years.

An official document of unquestioned accuracy and great significance to Hawaii has been published recently by the Department of Education of the Russell Sage Foundation, entitled "An Index No. for State School Systems," in which it is stated that "Among the interesting results of the study is the conclusion that the school systems of the United States Territorial possessions, such as Hawaii, the Canal Zone, and Porto Rico, have higher ratings than those of many of the 48 States; that of Hawaii is reported higher than those of the majority of the American States."

During the year there were maintained 173 public schools, with 1,161 teachers and 38,295 pupils, an increase of 6.07 per cent over the previous year's enrollment, and 59 private schools, with 384 teachers and 7,406 pupils, an increase of 237 over the prior year.

The number of pupils of all races in public and private schools was 45,701, as against 43,271 for the year 1919.

By an act of the legislature effective July 1, 1920, the University of Hawaii was established. This institution grew out of the College of Hawaii. The college has continued its cooperation with the United States Public Health Service and the Territorial Board of Health in the treatment of leprosy; all derivatives of chaulmoogra oil used at the Kalihi Hospital have been prepared at the college laboratory.

The total registration of students for the year was 242, of whom 106 were studying for degrees, as against a total of 145, and 68 working for degree the previous year.

The geographic distribution of the students is as follows: Oahu, 161; Hawaii, 44; Maui, 18; Kauai, 11; Lanai, 1; California, 3; Kentucky, Missouri, China, Japan, each 1.

Nine degrees were conferred at the ninth annual commencement, held May 31, 1920—eight bachelors of science and one master of science.

There are two industrial schools in the Territory, one for boys, situated at Waialeale on the northern shore of the Island of Oahu, and one for girls at Moiliili, a suburb of Honolulu. These institutions received and cared for all juvenile delinquents who were not paroled or put on probation by the Juvenile Court in Honolulu or the circuit judges of the outside islands, who act as juvenile judges. The instruction is chiefly vocational, and the children receive a portion of their earnings. There were 153 boys in the school at the end of the year, whose ages ranged from 8 to 20 years, and in the girls' school there were 138 girls. The school has land under cultivation as follows: Cane, 35 acres; taro, 14 acres; alfalfa, 5 acres; potatoes, 5 acres; sorghum, 11½ acres; para grass, 4 acres; and pineapples, 226 acres.

In the Hawaiian Library the registration at the end of the year was 10,066, an increase of 1,109 persons, or about 13 per cent over the previous year. There were 5,615 adults holding cards and 4,451 children. The home use of books was 144,381, an increase of 28,863; the adult increase was 15,996, and the juvenile increase 12,897. In the reference department a larger number of students are coming for help. Special interest has been given to the work in the children's department by the cooperation of the school administration. The opportunities in this particular department are becoming more and more far-reaching. Eminent educators who are interested in the improvement of the Territorial school system emphasize the importance of books as a medium of Americanization. The library holds an important place as a social center, and 224 meetings of civic and educational import were held during the year.

Special effort has been made toward indexing documents relating to land matters, as the calls for information of this nature are more numerous than for any other. This index, which at the beginning

of the year was completed to May, 1866, has progressed well and is now finished to June, 1874, together with a general index of the letter books of the interior department, Kingdom of Hawaii, to June, 1873. Indexing of the correspondence between the governor and the commissioner of public lands is complete to 1907. Another index which has proved of much value in furnishing information on a variety of subjects is of articles appearing in the bound volumes of newspapers on file in the archives. The several departments and the general public have been furnished with the usual amount of information. The work of revising the Hawaiian Dictionary has progressed steadily, and it is hoped to have it ready for the printer by the end of the next fiscal year.

Public Health.—The death rate for the year was 17.53 per 1,000, figured on an estimated population on June 30, 1920, of 260,300. An analysis of the mortality and morbidity statistics shows an increase of 2.17 in the mortality rate, as compared with the previous year, which increase was due principally to the large number of deaths from influenza, 1,088, as compared with 612 for the year 1919.

There has been gratifying success in the treatment of leprosy by the ethyl esters of chaulmoogra oil, and as a result of the publicity given to this method of treatment at Kalihi Hospital, Honolulu, persons suffering from the disease have come voluntarily, waived their legal right to have an examination by a medical board of three physicians, and have willingly abided by the decision of the attending physician of the hospital as to their condition. It is confidently believed, as a result of the publicity given the treatment by those who have recovered and been paroled during the last year, as well as by others, that the former practice of hiding away will be abandoned and that persons afflicted will promptly enter Kalihi Hospital in order to receive the benefits of treatment.

Act No. 169 of the 1919 legislature continued the position of herb specialist for the purpose of recording the value of medicinal herbs known to the Hawaiians. This work is progressing well, but is necessarily very slow, as the specialist must follow up many details of information through others who also have first hand knowledge of the value of many herbs.

There were 19,708 cases of contagious diseases reported, an increase of 5,092 over the previous year. This large increase was almost entirely due to the outbreak of influenza in the spring, there being 17,411 such cases reported, which is 4,912 more than for the preceding year. There was an increase noted in typhoid, influenza, tetanus, paratyphoid, plague, scarlet fever, tuberculosis, trachoma, and varicella, while there was a decrease in the cases of diphtheria, pertussis, meningitis, measles, and leprosy. The epidemic of influenza during the winter and spring was the most important and serious problem the

board of health was called on to handle. Influenza was first made a reportable disease in October, 1918, and since that time the Territory has never been free of the disease. In October, 1919, an increase in the number of cases reported was first noted on the island of Kauai, and it was not until January of this year that any increase was noted on the other islands. The peak of the epidemic was reached in the latter part of February and subsided to normal by the middle of April.

The children of all but six schools were physically examined by the medical director or Government physicians of the various districts. In addition, the oculist of the board of health examined all children having trachoma in the schools of Honolulu as well as those of several other schools on Oahu. He was also sent to Kauai in May and while there visited 18 schools, examining 5,144 children, with the result that the usual 10 per cent of abnormal conditions was found; these included old eye injuries, strabismus, errors of refraction, trachoma, and contagious conjunctivitis.

In the course of the medical examination of the children in the Honolulu schools a large number of undernourished children were found. A campaign was started to raise sufficient funds to provide nourishment or school lunches where necessary. Through the splendid assistance of the woman's central committee on child welfare of Honolulu, sufficient funds were obtained and the feeding of the children at the schools was soon in successful operation. Similar committees on Maui and Kauai, with financial assistance from the board of health, have looked after undernourished children on those islands.

Insane asylum.—At the beginning of the fiscal year there were under treatment in the insane asylum, paroled and escaped, 278 male patients and 104 female, a total of 382. There were admitted during the year 76 males and 32 females, a total of 108. Cases under treatment during the entire year totaled 490. Fifty patients, comprising 32 men and 18 women, were discharged as recovered; 18 men and 5 women were discharged as improved; and 32 men and 8 women died during the year. At the close of the year there remained 378 patients, 274 men and 104 women.

Leprosy.—The number of lepers living at the settlement at Kalaulapa and Kalawao during the year was 546, and of these 350 were males and 196 females; leaving at the settlement on June 30, 1920, a total of 546. The nationality of the patients at the settlement was as follows: American, 1; Belgian, 1; Chinese, 21; Filipino, 14; German, 3; Hawaiian, 325; Japanese, 12; Korean, 12; New Hebrides, 1; part-Hawaiian, 111; Portuguese, 41; Porto Rican, 3; Spanish, 1.

The number of lepers living at the different homes in the settlement are as follows: Baldwin Home, 69; Bishop Home, 43; Bay

View Home, 62; General Hospital, 20; McVeigh Home, 13; outside, 339.

Transportation facilities.—Traffic with the mainland was conducted principally through the Matson Navigation Co., which is now operating five steamers in the direct passenger service between San Francisco and Honolulu, and one steamer, the *Enterprise*, in the San Francisco-Hilo direct service. This service will be augmented in the early part of 1921 by the addition of two 535-foot steamers, the *Buckeye State* and the *Hawkeye State*, which have been allocated to the company for service between New York and Honolulu via Panama Canal and San Francisco. These vessels are of approximately 11,000 tons cargo capacity each, and will have passenger accommodations for 260 first-class passengers.

The vessels being operated at present in the passenger service of the company are the *Lurline* and the *Manoa*, of 5,928 and 6,805 tons, respectively; the *Matsonia*, of 9,728 tons; the *Mau*i, of 10,621 tons; and the *Wilhelmina*, of 6,974 tons; the total passenger accommodations of these five vessels are 1,794.

Through service.—The Pacific Mail Steamship Co. has continued to operate the *Colombia*, *Ecuador*, and *Venezuela*, vessels of 14,000 tons each, between San Francisco and oriental ports, with stopovers at Honolulu both ways. Ten large freighters have also been put in this service, and there is a Manila-East India service with two 16,000-ton passenger and freight steamers, the *Santa Cruz* and *Colusa*, stopping regularly at Honolulu both ways. This company has recently announced that the United States Shipping Board has allocated to it five of the new "State" class liners, the first steamer to be in service about December and the others to follow at short intervals. They will be operated in the trans-Pacific service, calling at Honolulu, Yokohama, Kobe, Shanghai, Manila, and Hongkong. These five will be followed in a short time by three more to operate in the Manila-East India service, calling at Honolulu, Manila, Saigon, Singapore, Calcutta, and Colombo. These steamers are 535 feet in length, 72 feet beam, 30 feet 6 inches draft, and of 12,600 dead-weight tons. Passenger accommodations are provided for 250 first class and 300 second class. In placing these vessels on the Pacific, the company expects to bring Manila within 16 days of San Francisco, a service of great importance to the trade of this Territory. The run to Singapore will be made in 25 days, and to Calcutta in 35 days.

The Toyo Kisen Kaisha operates a fleet consisting of the *Shinyo Maru* and *Tenyo Maru*, of 22,000 tons each; the *Siberia Maru* and *Korea Maru*, of 20,000 tons each; and the *Persia Maru*, of 9,000 tons. These vessels are on the run between China, Japan, Honolulu, and San Francisco, while the *Anyo Maru*, of 18,500 tons; the *Kiyo Maru*,

of 17,000 tons; and the *Seiyo Maru*, of 14,000 tons, are on the run which includes China; Japan, Honolulu, San Francisco, Mexico, Panama, and South America. The three latter vessels call at Hilo after leaving Honolulu on the way out from Japan.

The Oceanic Steamship Co. operates the steamers *Sonoma* and *Ventura* in the San Francisco, Honolulu, Pago Pago, Sydney service. These vessels touch at all points every four and five weeks. They have a tonnage of about 6,200 gross each, length 400 feet, passenger capacity about 250 in all classes.

The Canadian-Australasian Royal Mail Line has two steamers on the Sydney, Auckland, Suva, Honolulu, and Vancouver run, maintained every 28 days in each direction. These are the *Niagara*, a triple-screw vessel, oil burning, length 543 feet, gross tonnage 13,500, accommodations for 667 passengers; and the *Makura*, twin screw, now being transformed from coal to oil burner; gross tonnage 8,075, length 450 feet, passenger accommodations 400.

The Standard Oil Co. operates a fleet of vessels which bring oil to the Hawaiian Islands. During the year these brought 1,254,000 barrels of oil, including fuel oil, gasoline, distillate, and kerosene.

The Associated Oil Co. operated four vessels in its Hawaiian service, these bringing 409,718.13 barrels of oil during the year. No refined oil was handled by the company during the period. The Honolulu plant has recently been enlarged with a view to reentering the refined-oil service. Tankage has been constructed to allow for the storage of approximately 20,000 barrels of gasoline.

The China Mail Steamship Co. operated the steamers *China*, *Nile*, and *Nanking* between San Francisco and oriental ports, carrying first, second, and third class passengers to and from Honolulu. The United States Government returned the *Nanking*, which was requisitioned for war purposes, and this vessel is now operating on a regular schedule.

Interisland traffic.—Most of the interisland traffic is conducted by the Inter Island Steam Navigation Co. (Ltd.), operating a fleet of 11 steamers, varying in length from 136.1 to 252 feet and from 11.5 to 18 feet draft, from 341 to 1,566 gross tons and from 201 to 940 net tons, the total tonnage being 8,987 gross and 5,834 net. During the year this company carried 95,237 passengers and 393,140 tons of freight, an increase of 13,434 passengers and a decrease of 6,890 tons of freight as compared with the prior year.

Steam railroads.—The roads carrying passengers and freight, as well as those operated by the private plantations, are shown in the following table:

Islands and roads.	Track.	Gauge.	Rolling stock.		
			Locomotives.	Passenger cars.	Freight cars.
Oahu:	<i>Miles.</i>	<i>Ft. in.</i>			
Oahu Ry. & Land Co. ¹	146.06	3 0	25	53	757
Koolau Ry. Co. (Ltd.) ¹	11.00	3 0	1	2	21
Hawaii:					
West Hawaii R. R. Co.....	11.00	3 0	2	.....	36
Hawaii Ry. Co. (Ltd.).....	20.00	3 0	4	4	56
Hawaii Consolidated Ry. (Ltd.) ¹	99.50	4 8½	11	16	123
Mau: Kahului R. R. Co.....	42.19	3 0	9	7	173
Kauai: Kauai Ry. Co.....	19.22	2 6	1	.....	29
Total	348.97	.....	53	82	1,195

Islands and roads.	Freight carried.	Passengers carried.	Bonds outstanding.	Rate of interest.	Capital stock.
Oahu:	<i>Tons.</i>			<i>Per cent.</i>	
Oahu Ry. & Land Co. ¹	948,383	1,407,645	\$2,000,000	5	\$5,000,000
Koolau Ry. Co. (Ltd.) ¹	19,412	1,762	.....	.....	150,000
Hawaii:					
West Hawaii R. R. Co.....	44,982	110	.....	.....	360,000
Hawaii Ry. Co. (Ltd.).....	198,444	523,378	2,500,000	5	100,000
Hawaii Consolidated Ry. (Ltd.) ¹	198,444	523,378	.....	.....	2,654,960
Mau: Kahului R. R. Co.....	101,015	121,675	.....	.....	300,000
Kauai: Kauai Ry. Co.....	18,562	.....	218,000	6	500,000
Total	1,327,798	2,054,568	4,718,000	.....	9,064,960

¹ Calendar year 1919.

PRIVATE (PLANTATION) RAILWAYS.

Island.	Number.	Track.	Locomotives.	Passenger cars.	Freight cars.
Oahu	9	198.75	33	12	2,840
Hawaii	11	97.29	25	2	1,395
Mau	7	187.46	26	1	3,139
Kauai	8	144.46	33	9	2,567
Total	35	627.96	117	24	9,941

Street railroads.—The Honolulu Rapid Transit & Land Co. controls and operates the only street railway system in the Territory. It is an electric line, partly single and partly double track.

During the year 1919 the company expended for betterment of the system \$67,697.21. Outstanding capital stock is \$2,000,000. Gross income for the calendar year was \$780,946.21, an increase of \$45,795.07 over that of the preceding year. Disbursements were \$862,997.08, an increase of \$48,260.37. The number of fare passengers was 15,225,168, an increase of 920,679 over the previous year. The number of free passengers carried, principally policemen, letter carriers, firemen, and employees, was 158,268.

School children are carried at half rate. The car mileage was 2,100,573.67.

Telegraphs and telephones.—In addition to the cable system across the Pacific Ocean, which has been in operation a number of years,

there are three wireless plants, these being the Naval Radio Communication Service, the Radio Corporation of America, and the wireless department of the Mutual Telephone Co.

The Mutual Telephone Co. operates the principal telephone system on the island of Oahu. No figures have been submitted by this company for the last fiscal year, but in 1919 it had in operation 7,775 instruments in Honolulu and 777 instruments in the outside districts.

The Hawaii Telephone Co., of Hilo, operates 1,816 telephones, with 2,921 miles of open wire. The Maui Telephone Co., of Wailuku, has 1,205 instruments and 1,882 miles of wire. The Kauai Telephonic Co., of Lihue, has 280 telephones and 495 miles of wire.

ELEEMOSYNARY INSTITUTIONS.

ST. ELIZABETHS HOSPITAL.

Movement of population.—On June 30, 1920, there were remaining in the hospital 3,468 patients, as against 3,586 remaining June 30, 1919, a decrease of 118 over the previous year. There were admitted during the year 1,042. The total number of patients under treatment during the year was 4,628. The number of discharges, including deaths, was 1,160. The daily average population was 3,489, as compared with 3,638 during the year 1918-19, a decrease of 149.

Movement of population, fiscal year ended June 30, 1920.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1919.....	2,261	460	542	323	3,586
Admitted during year 1919-20.....	641	151	173	77	1,042
Total number under treatment during year ending June 30, 1920.....	2,902	611	715	400	4,628
Discharged:					
Recovered.....	222	29	26	13	290
Improved.....	223	27	18	12	280
Unimproved.....	156	29	30	13	228
Not insane.....	80	1	19	2	83
Died.....	167	45	38	30	280
Total discharged and died.....	828	131	131	70	1,160
Remaining June 30, 1920.....	2,074	480	584	330	3,468

Training school.—The entrance examination was held at the hospital on October 4, 1919. One hundred and eighty-four attendants entered the examination, 136 of whom passed and were admitted to the junior class. Forty-nine of these were soon dropped on account of lack of interest, inability to keep up with the work, etc., leaving a class of 87. One member of the class died, 6 were discharged during the year, 5 have resigned, 17 voluntarily dropped from the class, and 20 failed in their examinations, leaving 38 who have satisfac-

torily passed their junior work and been promoted to the senior class. The juniors received 25 lectures, spent 25 hours in recitation, and 24 hours in demonstrations, in addition to their practical work on the wards, which continued throughout the year. The senior class at the beginning of the term consisted of 24 members. Two of them resigned, two were discharged, four failed in their examinations. The seniors received 30 lectures, spent 25 hours in recitation, and 20 hours in demonstration. The nurses from 6 of the hospitals in the city attended the course in human behavior and mental diseases given to the senior pupils. A special course in dietetics was given the senior class, each member of the class received 10 hours' instruction. Tuesday and Friday mornings, special demonstrations were held in the operating room; these included preparation of instruments, dressings, solutions, etc. Four members of the class received these instructions for a period of six weeks at a time. Thirty-five major operations were performed during the year in addition to the minor surgery, reduction of fractures, application of casts, etc. A special course in massage was given the senior class by the chief of the training school. Each pupil spent one month in the hydrotherapy department. Graduating exercises were held in Hitchcock Hall June 9, 1920. Sixteen members of the class received their diplomas.

Hospital work.—During the year 1,653 cases were presented to the staff for consideration, of which 860 were presentations for the first time, and 793 had been previously under consideration. During the year 26 major and 2,607 minor operations were performed. These patients were seen previously to operation in consultation by the consulting surgeons; in addition many other patients were seen from time to time during the year, nearly every member of the consulting staff being called upon from time to time for advice. In the hydrotherapeutic department 56,948 treatments were given. In the eye, ear, nose, and throat department there were 476 examinations and treatments; 401 cases were considered by the clinical psychiatrist. In the dental department 2,596 received treatment at various times.

In the clinical pathological section of the laboratories 5,462 examinations were made and reported and 478 bacteriological examinations. The work in the psychological laboratory has continued to be mostly concerned with neurological cases; the work on the reeducation procedures in that class of cases has been continued in which there has been the active cooperation of members of the occupational therapy department. Six hundred and fifty patients were examined röntgenographically, and in addition there were 1,107 fluoroscopic examinations. The routine work of photographing patients has been continued as in the past; during the year 1,080 plates and 1,580 prints were made. A series of biweekly clinico-pathological meetings of

the staff were inaugurated to consider matters relating to psychiatry and internal medicine of general interest; special programs of these meetings were arranged, to which the department laboratories contributed very largely. There were also inaugurated a series of evening staff meetings at which outside physicians and others having messages of medical interest were invited to lecture and give account of their work.

Department of internal medicine.—A¹ plan for a new department was created during the year, known as the department of internal medicine.

The function of this department is to care for all patients and employees of the institution who, from any cause, acquire a physical disability, and also to take steps to study the relationship existing between physiological and organic abnormalities and the mental symptoms. R building was selected and equipment ordered for this purpose. On June 15 two wards and on June 17 a third ward was opened, the first two for white males and the third for white females. On June 30 there were 34 white males and 30 white females under medical or surgical care.

A diet kitchen has been organized and established on the second floor under the personal supervision of a competent dietitian and is now able to furnish any special diet which may be required in the treatment of any type of case. This is of great benefit in treating the cardiorenal and gastro-intestinal cases especially.

A room has been equipped and set aside for the minor surgical work and the routine salvarsan work.

Those cases requiring surgical measures are attended to in the main operating room in C building and brought to the R building as post-operative cases for further necessary care.

The kitchen in the basement is running under full personnel for the routine feeding of all cases not requiring special diet and for the patient helpers who are working in the building.

Attention has been paid to the treatment of patients suffering from syphilis of the central nervous system. The time of one physician is entirely devoted to this work, the additional facilities in R building being placed at his disposal.

Out-patient department.—The service attempted by this department has two objectives: First, to assist the patient leaving the institution to an adjustment of maximum success; second, to aid other individuals at the onset of their difficulty to adapt to the surroundings. In both instances the procedure consists of a scientific study of the patient as a unique combination of conduct determinants, and of an intensive study of his environment as it aggravates his difficulties, with a view to treatment and correction.

This study is conducted at the clinic, detached from the hospital. The psychiatrist is available three days a week, from 2 to 5 p. m., when he carries on his psychological investigations. The observations made by the social worker in investigating the patient's contacts at home, at work, at play, etc., are submitted to him, whose prescription becomes her guide in efforts to bring the aggravating elements under control. The closest cooperation with the hospital, with other hospitals, and with contemporary social agencies is maintained.

For the hospital, this department aims to be the interlocutor between the institution and its out-patient; investigating home conditions prior to parole, soliciting proper environment and employment for prospectives, observing paroled patients, attempting to locate runaways, encouraging discharged patients to maintain their contact with the clinic, and recommending to the institution their further disposition.

In the community work at large frequently child-helping agencies refer their defective dependents for examination and recommendation as to proper placement in institutions outside of the District, and hence inaccessible for any follow-up.

Six hundred and eighty-seven cases were handled by the mental hygiene clinic and 456 in connection with the community service.

Industrial department.—During the past year the difficulty in getting the necessary labor and supplies has interfered to some extent with the efforts to increase the industrial departments of the hospital. However, it has been found notwithstanding this fact the work of the brush and broom shop, mattress shop, upholstering department, the manufacture and repair of shoes, the manufacturing of straw hats and knit stockings, the tailor shop and sewing room providing the bed linen, wearing apparel, and house supplies of the institution has been regularly maintained, many patients being employed therein.

Since last July, when occupational therapy as a department was instituted in this hospital, material progress has been made. The crafts taught include basketry, knotting (hammocks, etc.), leather work, weaving, toy making, and applied arts, plain sewing, fancy needlework, woodwork, gardening. Under the guidance of the supervisor of this department and her assistants the patients have made very material progress, and an exhibit of the work was sent to Cleveland to the annual meeting of the Medico-Psychological Association, where this hospital was awarded a certificate of merit for the chart forms. Much of the material supplied for this department has been received from donations from well-wishers of the hospital, seeking to further the interests of the patients, and the patients have received

the financial benefits realized from the disposition of the articles made. These articles when made have been disposed of and some of the money used to reimburse the fund, and the profit divided up pro rata among the patients.

Recreation buildings.—The American Red Cross constructed a recreation building on the hospital reservation; this building has been open several months, and has been the means of adding materially to the comfort and welfare of the patients. From time to time socials and receptions are held at this building, not only for the patients but also for the employees. The representatives of the Red Cross at the hospital assist in the recreations provided for the patients and also in training the patients how to play. The representative of the Red Cross has conducted various games and amusements for the patients, setting-up exercises, football, volley ball, tennis, etc. Those who could not actively participate in these amusements stand along the sidelines and enjoy the fun. On pleasant days hundreds of the patients were either at work or on the lawns. The working patients are given benefits of other amusements, such as dances, moving pictures, auto rides, or are taken into town to musicals, concerts, and numerous entertainments. During the past year it was arranged that the various classes of welfare workers who assist in entertaining or looking after the patients should act through the Red Cross representatives, who should be liaison officers between the welfare workers and the hospital. It is believed that this has resulted in equalizing more generally the benefits to the patients.

In connection with the recreation building erected by the Red Cross, it donated the framework of a temporary building, which was transported to the hospital and erected for the use of the Knights of Columbus. In this building that organization gave the patients the benefit of training in carpentry and other industrial work; small toys, various classes of implements, and other articles are made at this shop.

Hospital personnel.—At the beginning of the year the hospital was still confronted with the great difficulty, due primarily to the war in which this country was involved, of getting a sufficient number of competent employees. During July, 1919, the great shortage of help in the ward service was relieved to some extent by a detail of ward employees from the Army and Navy. These men continued in the hospital until about August 15, 1919. The hospital had inserted advertisements in papers in various parts of the country for male and female help, outlining the advantages in becoming connected with this hospital, the salaries paid, showing the installation of an eight-hour day, the possibilities through the training school, and the location adjacent to the capital of the Nation; and in that way the hospital secured a fairly full quota of employees. The nurs-

ing force was placed upon an eight-hour basis, consisting of three sets of employees, each putting in their turn of eight hours, together with the fourth set consisting of graduate nurses whose time is so arranged that they dovetail and cover the periods during which the two changes of nurses on the day period take place. This change appears to have improved the conditions of the employees, made them more satisfied, and acted as an incentive to attract a better class of employees. The hospital has materially raised the salaries of employees, so that where about three years ago the entrance wage of female employees was \$15 per month and maintenance and the male employees \$20 per month and maintenance, both are placed on the same basis; that is, both receive the same entrance salary of \$40 per month plus a \$20 bonus as authorized by Congress, in addition to their maintenance. The increased number of employees required in order to put the hospital on an eight-hour basis made it impossible, with the limited facilities at hand, to provide them with quarters. An alternate pay roll was instituted, giving an allowance to all employees to whom it was desirable but impracticable or impossible to furnish quarters. This shortening of hours and increase of salaries, as stated, seem to have had a tendency to attract a higher class of employees. It is the aim to attract a class of employees that has higher educational experience and will be better enabled to fit themselves for the work through the training school for nurses attached to the institution. If the qualifications can be raised to a proper standard, it is hoped that in time it may be arranged to so extend the course of training that employees will be eligible for registering as graduate nurses in the District and in other States, in the same manner as the nurses from the general training schools.

In connection with the better treatment of patients, the hospital is now adding to the class of employees used as nurses a limited number of nurses graduated from the general nurses' training school. It is proposed, if these nurses have not already graduated from the psychiatric school, to have them take the hospital training, and when their education is completed one of each is to be placed in charge of each service of the hospital and one put on night duty, and they are to be held responsible for the general care of the patients, as far as the actual need of nursing is concerned.

The enlarged appropriation, as authorized by Congress, permitted the increase of the medical staff and additional classes in order to get better facilities for the treatment. During the reorganization of the staff the hospital was not only enabled to fill several vacancies that existed—as first assistant physician, clinical director, senior assistant physicians, assistant physicians, junior assistant physicians, and medical interns—but also to add new classes to the staff, such as internist, psychiatrist, neuropathologist, bacteriologist, resident

dentist, and assistant dentist, and also to provide these officers with adequate assistants, such as laboratory technicians of the various kinds. Additional positions created, some of which have been filled, are that of superintendent of occupational therapy aids, social-service workers, dietitians, and automobile mechanics.

In the last sundry civil appropriation act Congress authorized the creation of the position of deputy disbursing agent of the hospital. This position has just been filled by the promotion of a faithful employee who has long been assistant to the disbursing officer of the hospital. The appointment of this employee places the hospital in the position of being able at all times to have an employee on hand legally competent to sign checks at any and all times during office hours. This is a great change from the period previous to 1909, when the superintendent was compelled, in addition to his other duties, to act as disbursing agent for the institution and thus sign all checks, as administrative head, and also was compelled to approve all vouchers paying for supplies, while at the present time the hospital not only has an administrative assistant who may alternate with the superintendent for the approval of vouchers, but there is also a separate disbursing agent and a deputy disbursing agent authorized to pay claims as they arise.

New legislation and hospital needs.—In 1912 a committee consisting of Surg. Gen. George H. Torney, United States Army, representing the Secretary of War; Surg. A. W. Dunbar, representing the Secretary of the Navy; Mr. Robert V. La Dow, superintendent of prisons, representing the Attorney General; Maj. William J. Judson, Corps of Engineers, United States Army, representing the Commissioners of the District of Columbia; Mr. Scott C. Bone, representing the board of visitors of the Government Hospital for the Insane; and Dr. William A. White, superintendent of the Government Hospital for the Insane, representing the department, were, after consultation with the President, designated by the Secretary of the Interior to make a thorough investigation of the needs of the hospital and the future policy for its growth and development; their report was subsequently transmitted by the President to Congress for consideration. (S. Doc. No. 256, 62d Cong., 2d sess.)

This report discusses very fully the needs of the hospital under four heads: (a) Defects in the laws governing the conduct of the institution and the commitment of patients. Under this head is included a draft of proposed legislation for commitment from the District of Columbia, along with certain changes in the legislation with reference to the transfer of Federal prisoners to the hospital. (b) The advisability of continuing in the hospital patients committed from the District of Columbia and from the Army and Navy and from distant points. Under this head is discussed the whole ques-

tion of the future policy of the hospital with reference to the commitment of patients from distant points. (c) The policy to be adopted relating to the growth of the institution, and the matter of additional lands, buildings, equipment, etc. Here the question of administration, size of the institution, and its physical needs are discussed, together with a special report as to the care of the criminal insane. (d) The present conduct of the institution, including recommendations for improvement of the service and the advancement of the interests of the inmates. Under the third section the needs of the hospital are set forth.

During the first session of the Sixty-fourth Congress, Senate bill 6222 was introduced, "To provide for admissions to the Government Hospital for the Insane, and for other purposes," drawn along the lines recommended in the above-mentioned report, and was referred to the Senate Committee on the District of Columbia. This bill had the approval of the department, as well as of the Commissioners of the District of Columbia, but failed to become a law. In July of 1919 the superintendent of the hospital submitted for consideration a tentative draft of the bill for regulating the process of commitment for the hospital in the District of Columbia, and stated that:

For many years I have been very much opposed to the present methods and very desirous of improving them. The present bill is the result of activities looking in that direction, the various questions having been taken up with the important civic organizations of the District of Columbia and with the members of the bench. While the bill is not all that I could wish it to be, still it offers a very great improvement upon the present methods of procedure. The main features of this improvement are two: It provides for doing away with the adjudication of the alleged insane person, unless said person or some friend or relative on his behalf or the court itself sees fit to request it. This is provided in section 9 of the bill. The method of procedure would therefore be to send the patient to the hospital under temporary papers just as at present and permit the patient to continue under this temporary form of commitment unless some demand was made for a hearing in court. This would obviate the necessity for such hearings in the vast majority of cases. Secondly, there is a provision for voluntary commitment provided for in section 11. I am very anxious to get some cure in the present commitment system in the District of Columbia and will therefore thank you, if this bill meets with your approval, to send it forward to Congress for introduction.

This bill was referred to the Commissioners of the District of Columbia for expression of their views thereon. After consideration of the matter the commissioners caused the bill to be redrafted so as to embody certain desirable changes and in forwarding the same to the department under date of March 16, 1920, stated that:

The commissioners believe that there is a great public necessity for the passage of such a measure, and they believe that the substitute bill, which they inclose, will accomplish the result desired. The merits of the measure may be briefly described as follows: The important changes sought to be effected in

the present procedure by the proposed bill are two: First, the bill provides that persons held for treatment as alleged insane persons, upon temporary commitments in accordance with the present procedure, may be held so long as is necessary for care and treatment without formal trial in open court as now required, unless such a formal proceeding is demanded by the alleged insane person or by his relative or friend or by the Commissioners of the District of Columbia; or unless the court shall of its own motion order such a formal proceeding. The purpose of this proposed change is to permit detention and treatment of mentally disturbed persons who have been duly admitted upon affidavits supported by the certificates of two physicians. The present law provides that persons so admitted may be held for not to exceed 30 days and that before a permanent or indefinite commitment is made the patient must be brought into court and tried in what amounts to quasi-criminal proceeding. This process is harsh and unnecessary and in many instances highly injurious to the patient. The proposed law provides such safeguards and opportunity for public hearings that there is no danger that persons would be improperly committed and held. In very many jurisdictions the law now permits the detention of insane persons without the old quasi-criminal form of procedure that is still required in the District of Columbia.

The second purpose sought in the bill is to provide for what is known as "voluntary commitment." That is, that a person realizing himself or herself to be in such a condition of nervous or mental disturbance as to need supervision and treatment may voluntarily submit himself or herself to such treatment and that the superintendent of the hospital may under such circumstances detain for treatment such persons, provided that no such persons shall be detained more than three days after having given notice in writing of their desire to be released. This feature of the bill is urged, because it is believed that many persons because of their mental or nervous condition require and could be benefited by early treatment and would seek such treatment if it were possible to receive it without submitting to a formal certification of insanity; and that in many instances persons so treated would be restored to normal mental and nervous condition when in the absence of proper treatment they might actually become insane and require detention and treatment for an indefinite period.

Subsequently at the instance of the department the bill as re-drafted was introduced in Congress as House bill 13427 "To amend section 115a of an act entitled 'An act to establish a code of law for the District of Columbia,' as amended." This bill, which has the approval of the department, was referred to the House Committee on the District of Columbia and is now pending therein. It is desirable that early and favorable action be had thereon.

FREEDMEN'S HOSPITAL.

Movement of the population.—At the beginning of the fiscal year on June 30, 1919, there were 218 patients in the hospital; during the year ended June 30, 1920, there were admitted 3,714, making a total of 3,906 patients under care, as against 4,070 the preceding year. Of those admitted, 867, including 82 births, were pay patients, 1,217, including 102 births, were indigent residents of the various States and Territories, and 1,630, including 151 births, were indigent resi-

dents of the District of Columbia. There were discharged during the year 3,745 patients. Of this number 1,830 recovered from their ailments, 1,353 improved, 252 unimproved, 47 not treated, and 263 died.

As regards the admission of patients, it is noticeable that there was an increase of 136 indigent patients from the States and Territories admitted over last year, while there were 192 fewer indigent patients from the District of Columbia and 92 fewer pay patients. The receipts from pay patients amounted to \$21,664.50, exceeding last year's receipts by \$4,034.40, or seven times more than the sum received in 1913, the year this service began.

Problems of the year.—The year has been, to a large degree, one of readjustment, following the disorganization incident to the war. The professional staff has been practically restored to a prewar basis, so that the clinical work in the various departments of the hospital has gone on during the year uninterrupted and unhampered, except for the want of certain equipment.

At the request of the Vocational Education Board, and in accordance with the rehabilitation act, one disabled discharged soldier, a physician, was received for further training in abdominal diagnosis, X-ray work, and urology. It is a pleasure to note that this soldier has been greatly benefited, and the hospital has profited by his service.

There were many difficult problems arising from the labor situation, owing to its scarcity, inferior quality, and higher wage demands. It is expected, however, that this condition will soon improve, a substantial increase of salaries having been provided for the fiscal year beginning July 1, 1920.

Other difficult problems arose during the year. The most perplexing among them, from an administrative view, was the increased cost of almost all necessities for hospital work. The current expenses were in excess of any sum ever expended. In providing sufficient for the urgent needs to keep the hospital in operation a deficit of \$9,408.63 was created, the second deficiency in 16 years. The third deficiency act, approved June 5, 1920, carried an appropriation sufficient to wipe out this deficit.

Hospital work.—The surgical work shows an increase over the preceding year, there being 2,016 operations performed, as against 1,940 the previous year, and with gratifying results. In the dispensary or out-patient department 6,393, or 1,058 more than last year, were treated, as follows: Medical, 881; minor surgical, 787; neurological, 121; orthopedical, 176; pediatrial, 370; dermatological, 295; tuberculosis, 19; otorhinological, 853; urological, 408; gynecological, 814, and ophthalmological, 1,669.

Those attending the clinics made 12,314 revisits to the several divisions of this department, 2,590 being for surgical dressings. The

total number of indoor and outdoor patients receiving the benefits of the hospital was 10,299, as against 9,405 the preceding year. The admissions to the hospital during the last 10 years were as follows: 1910, 2,740; 1911, 2,900; 1912, 3,385; 1913, 3,208; 1914, 3,144; 1915, 3,348; 1916, 3,491; 1917, 3,886; 1918, 3,648; 1919, 3,852; 1920, 3,714.

Hospital needs.—The surgeon in chief states that—

Attention has been called in previous annual reports to the need of several important additions to the hospital, which if supplied would make this institution a well-rounded hospital and would add greatly to its usefulness in the care of the sick. Although some are so important that it constitutes a very serious weakness of our establishment, it is thought best not to urge all anew at this time, owing to the high cost of building material and uncertain labor conditions. However, the building must be kept in a proper state of repair, and certain additions must be made and equipment replaced if the hospital is to continue to function anywhere near the standard already established. For this purpose \$4,000 should be provided for painting and repairs, \$2,990 for new surgical and medical equipment, \$16,500 for the replacement of the mechanical stoker in the boiler room, and \$65,000 for a pathological building. These items are so urgent and essential to the welfare of the hospital that further delay in providing the necessary appropriations is likely to lead to no little embarrassment to the institution.

Training school for nurses.—The training school for nurses at present provides for a course of three years and requires a high-school education as an essential for attendance. During the year 60 applications were received, 23 applicants were taken on probation, 12 accepted after probation, 2 not accepted after probation, 2 resigned, 1 was dismissed, and 8 are on probation.

The results of this branch of the service were highly satisfactory. The health of the nurses in training was much better than during the past year, although two resigned on account of ill health. Special instructions in dietetics at Howard University were continued as in former years; also a course in public-health nursing given at the central registry by the District of Columbia League of Nursing Education.

Seventeen women were graduated as nurses, the graduating exercises being held May 6, 1920, in the Andrew Rankin Memorial Chapel at Howard University. The total number of persons holding the certificates from this school aggregates 338.

Pay patients.—The act making appropriations for the sundry civil expenses of the Government for the fiscal year ending June 30, 1906, and for other purposes, approved March 3, 1905 (33 Stat., 1190), provides, among other things, that:

The Secretary of the Interior is authorized to enter into contract with the Board of Charities of the District of Columbia for the care and treatment of persons from the District of Columbia admitted to the Freedmen's Hospital; and any money that may be received, from this source, on and after July 1, 1905, shall be paid to the Secretary of the Interior, to be applied to the uses and purposes of the hospital.

Under this statute on the 5th of August, 1919, a contract was entered into with the Board of Charities of the District of Columbia, providing for the care of the indigent patients from the District of Columbia at the rate of \$1.75 for each full day for each person over 12 years of age cared for, maintained, and treated at the hospital; for the care, maintenance, and treatment of each child born in the hospital to any woman admitted from the District of Columbia, \$0.50 per day; and for the care and treatment of every other child from the District of Columbia under the age of 12 years, \$1 per day.

In the act "making appropriations to provide for the expenses of the District of Columbia for the fiscal year ending June 30, 1913, and for other purposes," approved June 26, 1912, provision is made, under the head of "medical charities," as follows:

Hereafter patients may be admitted to Freedman's Hospital for care and treatment on the payment of such reasonable charges therefor as the Secretary of the Interior may prescribe. All money so collected shall be paid into the Treasury to the credit of Freedmen's Hospital, to be disbursed under the supervision of the Secretary of the Interior for subsistence, fuel and light, clothing, bedding, forage, medicine, medical and surgical supplies, surgical instruments, repairs, furniture, and other absolutely necessary expenses incident to the management of the hospital, a report as to the expenditure thereof to be made annually to Congress.

Under this provision 867 pay patients, including 82 births, were received for treatment during the fiscal year 1920. The receipts therefrom amounted to \$21,664.50.

Receipts and disbursements.

RECEIPTS.

Appropriation, sundry civil act:	
For support	\$47,000.00
Salaries	33,360.00
	<hr/>
	80,360.00
Appropriations, third deficiency act	9,555.90
Appropriations, District of Columbia act (under contract with Board of Charities)	40,000.00
Pay patients	21,664.50
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Total	151,580.49

DISBURSEMENTS.

Miscellaneous, fuel, light, clothing, forage, medicine, etc.	38,906.03
Third deficiency	9,305.98
Pay patient	13,901.21
Subsistence	47,907.35
Pay patient	1,779.28
Salaries	33,234.14
Pay patient	4,885.27
Refunds, pay patients	994.90
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Total disbursements	150,914.14

Unexpended balances: Miscellaneous, fuel, light, clothing, forage, medicine, etc., \$93.97; third deficiency, \$250.01; pay patient, \$103.86; subsistence, \$92.65; salaries, \$125.86; total, \$666.35.

HOWARD UNIVERSITY.

The university was incorporated by the act of March 2, 1867 (14 Stat., 438). The object of the incorporation, named in the first section of the act, was "for the education of youth in liberal arts and sciences." It is declared that the incorporators shall be "a body politic and corporate, with perpetual succession." The management and control of the institution were vested in a board of not less than 13 trustees.

Students.—There were in attendance during the year 1,567 students from 38 States and 10 foreign countries.

Students during year ended June 30, 1920.

Junior college	558
School of liberal arts	98
School of education	34
School of commerce and finance	6
School of applied science	70
School of music	42
Certificate courses in music	59
Post graduates	3
School of religion	88
Certificate courses in religion	130
School of medicine	383
School of law	124
	1,595
Deducted for duplication	28
	1,567

One hundred and eighty-one completed their studies in the university and were graduated as follows:

School of liberal arts	64
School of education	19
Normal course	3
School of applied science	4
Two-year course	4
School of music	1
School of religion	9
School of medicine	62
Medical college	27
Dental college	26
Pharmaceutic college	9
School of law	14
Graduate studies, M. A. degree	1

Organization.—Beginning with the school year of 1919-20, the plan of collegiate work was revised and, in order that the registration figures may be understood, is here briefly sketched.

The college course of four years is divided into two parts of two years each. The first two years comprise the "Junior college." Here

are taught those subjects which are the basis of a liberal education. The second two years comprise the "Senior school." Here are taught those special subjects which fit the student for special work. Courses in the junior college will fit the student to enter the senior schools of liberal arts, education, journalism, commerce, and finance, or physical education, or he may go to graduate schools of law, medicine, or theology. The school of applied science demands its own full four years' course, while the courses in the school of music are taken in combination with the academic courses. Emphasis is laid upon the full four years' liberal arts course, but opportunity is given to specialize during the last two years, thus fitting the student to go at once to his life's task and at the same time have his college degree. Courses leading to the degree of M. A. have also been established under the supervision of a committee on graduate studies.

School of applied science.—A keener interest than ever before is being manifested by students who are registered in this school. This is doubtless due to the increased opportunities for employment in technical work of collegiate grade, as well as the university's increased facilities for instruction. With the opening of the current school year the department of architecture began its career with an enrollment of seven students.

Appropriations.—Although the institution was established in 1867, no appropriation was made by Congress for its support until March 3, 1879, when \$10,000 was appropriated for "maintenance." From that date up to July 19, 1919, the date of approval of the last sundry civil act, Congress has appropriated for the university for various purposes, mostly current expenses, a total of \$2,345,153.25.

All of the Government appropriations are expended by the Secretary of the Interior, who is a patron ex-officio of the board of trustees.

Property.—The auditors for the institution, in a report dated September 11, 1920, give the total value of all property belonging to the university at the close of the fiscal year June 30, 1920, as \$1,865,591.65, of which \$440,552.92 represents endowments, unproductive land fund, cash in bank, etc. The remainder of the property belonging to the university, valued at \$1,425,038.73, consists of the following: Land, \$616,238.73; buildings, \$624,361.52; and equipment, \$184,438.48.

This large property has been accumulated mainly from donations and the sale and the increase in value of about 120 acres of land originally purchased and subdivided by the university. The annual congressional appropriations have been mainly for the payment of salaries, the purchase of supplies, care of grounds, and other current expenses. Two buildings, a greenhouse, and a portion of the equipment have also been provided from Government appropriations.

COLUMBIA INSTITUTION FOR THE DEAF.

During the fiscal year July 1, 1919, through June 30, 1920, there were under instruction in the advanced department of the institution, known as Gallaudet College, 70 men and 56 women, a total of 126, representing 33 States, the District of Columbia, and Canada. This is an increase of 20 compared with the preceding year. There were admitted to the institution 30 females and 36 males; discharged 25 males and 29 females.

In the primary department, known as the Kendall School, there were under instruction 28 boys and 30 girls, a total of 58; an increase of 7 compared with the preceding year. Of the total in this department, 45 were admitted as beneficiaries of the District of Columbia.

The general health of the pupils of the institution was good, though there was one case of diphtheria and several cases requiring surgical operation. No deaths occurred during the year. Particular pains have been taken to maintain a high standard of cleanliness in the institution dairy.

The course of instruction as reported last year was carried out with the additional requirement of work in the use of the library on the part of the preparatory students. A large majority of the young women of the college petitioned for additional instruction in domestic science. This work will be started during the next fiscal year, provision having been made for a teacher in this subject.

Important meetings of educators of the deaf were held during the fiscal year. The first, a meeting of the Conference of Superintendents and Principals of American Schools, was held at Columbus, and the second, a joint meeting of the Convention of American Instructors of the Deaf, the American Association to Promote the Teaching of Speech to the Deaf, and the Society of Progressive Oral Advocates, was held at Mount Airy, Philadelphia, June 28-July 3, 1920. In all these meetings the officers of the institution took prominent parts.

At the close of the school year the degree of master of arts was conferred upon two graduates of the college and the degree of master of science upon one graduate. The degree of bachelor of arts was conferred upon seven members of the graduating class, the degree of bachelor of science upon three members, and the degree of bachelor of philosophy upon two members. The degree of bachelor of pedagogy was conferred upon one young woman graduate of the normal department, and a certificate of graduation was given to another member of the normal class.

The honorary degree of master of arts was conferred upon Mr. Jonathan Holbrook Eddy, a deaf teacher of wide experience and

ability connected with the Arkansas Deaf-Mute Institute, and upon Mr. Isaac B. Gardner, principal of the New York Institution for the Deaf, one of the oldest and largest schools for the instruction of deaf children in the United States.

The report of the treasurer of the institution shows the following balances in the private funds: General fund, \$801.41; manual-labor fund, \$1,037.90; memorial-art fund, \$145.20; a total of \$1,984.51. The total receipts of the year, including a balance of \$1,483.63 at the beginning of the fiscal year, other than private funds, was \$146,901.50; the total expenses were \$139,392.43, leaving a balance on hand of \$7,509.07.

Physical needs.—The institution is greatly in need of new buildings and extensive repairs to provide for its growth in the near future. The most necessary requirements are an administration building, a new dormitory for the Kendall School, an addition to the laboratory building, an addition to the power plant, and repairs to the dormitories and cottages used by the teachers and instructors. Roadways of the institution should soon be widened and resurfaced to meet the demands of modern heavy traffic, and the lawns and shrubbery should be given special attention.

Estimates for the fiscal year to end June 30, 1922, were as follows:

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements.....	\$125, 250
For repairs to the buildings of the institution, including plumbing and steamfitting, and for repairs to pavements within the grounds.....	10, 000
For the purchase of 6.2 acres of land between Mount Olivet Road, West Virginia Avenue, and the northeast boundary of the grounds of the institution, at present belonging to Richard E. Pairo.....	12, 000
For the purchase of an automobile truck.....	2, 500
For clearing and draining land along boundary of institution grounds adjacent to West Virginia Avenue, and for the erection of a boundary fence.....	2, 000
For a tile drainage system on the farm grounds of the institution....	2, 500
For the installation of refrigerating plant.....	7, 000

MARYLAND SCHOOL FOR THE BLIND.

Section 2 of the act of Congress approved May 29, 1858 (11 Stat., 294), authorizes the Secretary of the Interior to place for instruction in an institution for the blind, in the State of Maryland or some other State, the indigent blind children of teachable age who are children of persons actually engaged in the military and naval service of the United States, and under section 4869, Revised Statutes of the United States, the blind children of teachable age belonging to the District of Columbia..

The act of May 26, 1908 (35 Stat., 295), making appropriations for the District of Columbia, provided that after July 1, 1908, a contract

should be entered into by the Commissioners of the District of Columbia for the instruction, in Maryland or some other State, of indigent blind children of the District, appropriated \$6,000 for the purpose, and repealed the permanent indefinite appropriation under section 3689 of the Revised Statutes. Inasmuch as the Secretary of the Interior, by section 2 of the act of May 29, 1858 (11 Stat., 293), was also charged with providing for the instruction of the blind children of all persons in the military and naval service of the United States while such persons are actually in such service, the expense to be defrayed from the permanent indefinite appropriation above referred to, the question was submitted to the Comptroller of the Treasury as to whether that appropriation was repealed so far as to be no longer available for the instruction of this class of beneficiaries. In an opinion rendered October 27, 1908, the Comptroller of the Treasury held that the act of May 26, 1908, *supra*, only repealed the provisions of section 3689 of the Revised Statutes to the extent that said section provides for the education of the blind children of the District of Columbia, and that the permanent indefinite appropriation in question is still available for instructing the blind children of all persons in the military and naval service of the United States in some institution in Maryland or some other State, and that the Secretary of the Interior is authorized to continue to issue permits for the instruction of such children. No permits for this class of beneficiaries were issued during the last year.

SUPERINTENDENT OF THE UNITED STATES CAPITOL BUILDING AND GROUNDS.

The Superintendent of the United States Capitol Building and Grounds states in his annual report that miscellaneous repairs pertaining to all sections of the Capitol building have been made, including repairs to the roof and skylights, renewal and adjustment of elevator cables, and general repairs to plumbing and electric lighting, as well as 940 repairs of a minor character.

Senate wing.—Repairs to six rooms in Senate terrace, including painting, redecorating, wiring, and installation of new plumbing; the subdivision of space in the Senate stationery room into three rooms for the use of the Senate; painting, decorating, and restoring woodwork in room formerly occupied by the Senate storekeeper; inclosing a room by partitions with glass panels for the branch post office; forming a new room for the use of the Senate by dividing with a partition the room occupied by the page boys of the Senate; restoring Senate document room damaged by fire in January, 1920; continuing restoration of decorations, basement floor, Senate wing; re-wiring rooms of the doorkeeper, file room of Senate Committee on

Appropriations, principal room of Senate library, one room of law library, the ice machine, the coal vaults, the hot-water room.

Under provisions contained in the deficiency bill approved November 4, 1919, money was appropriated for the use of No. 23 B Street NW., formerly designated as the Old Telephone Building, as an addition to the space of the Senate folding room. The remodeling and repairs include a new heating arrangement and the connecting of the same to the heating plant of the Maltby Building; new plumbing with lavatories, closets, shower bath, necessary millwork to provide for the changed conditions of the rooms, overhauling and remodeling of the electric-lighting system, and providing for additional lighting service.

The Supreme Court room.—During the recess of the Supreme Court in 1919 the ceiling of the court room was removed and a new ceiling, composed of material intended to improve the acoustics, was installed, preserving in detail the architectural and decorative features of the former ceiling.

Works of art.—Five portraits of former Presidents, Senators, and Representatives and one portrait bust of Vice President Thomas R. Marshall have been added to the collection during the year and a list of six portraits received prior to the fiscal year 1920 and subsequent to the publication of the Catalogue of Works of Art in the United States Capitol building and not included in prior reports, is given.

Capitol Grounds.—New plantings include 130 shrubs and 5 trees. Two trees have been removed; 6 treated for cavities, and necessary trimming attended to; 1,500 square yards of sod have been placed, 6 acres of lawn reseeded; 14 plant cases pointed up, and all of the trees subject to attack by caterpillars, elm leaf beetles, and other leaf-eating insects have been sprayed with arsenate of lead solution.

Capitol power plant.—This plant furnished heat, light, and power to the group of buildings containing the United States Capitol, the Library of Congress, the Senate and House Office Buildings, totaling heat for 45,613,550 cubic feet of space, current for 49,750 electric lights, 1,217 electric fans; power for motors totaling 1,466 horsepower, 49 electric elevators and lifts, also current for the dormitories to the north of the Capitol Grounds under control of the United States Housing Corporation. Extensive repairs have been made to the waterways connecting the pumping station with the plant and incidental repairs and replacements to the mechanical and electrical equipment.

Engine house, Senate and House stables.—All of the buildings grouped under this appropriation have been given required repairs to roofs, woodwork, plumbing, and electrical equipment.

Columbia Hospital for Women and Lying-in Asylum.—All classes of mechanical and electrical equipment have been overhauled and repaired, adjustment of doors and windows made, and the lawns surrounding the hospital buildings regraded and reseeded.

Courthouse, Washington, D. C.—The restoration and reconstruction of this historic building was completed in season for its occupancy by the courts of the District for the October sessions. Nearly three years were occupied in this work, the sessions of the courts in the meanwhile being held in temporary quarters leased for their use. The entire cost of the work, including new furnishings, was \$852,000. Interesting public exercises commemorating the restoration of the building were held in the grounds adjoining the north side of the courthouse on October 27, 1919.

Enlarging the Capitol Grounds.—The act of August 26, 1912 (37 Stat., 594), imposes on the Secretary of the Interior the duty of renting until removed property acquired under the act of June 25, 1910 (36 Stat., 739), and supplementary acts for the enlargement of the Capitol Grounds. During the fiscal year 1920 no properties additional to those acquired during 1916 and prior years were secured. As to the properties in square 633, the title to which is in the United States, no action has yet been taken by the Superintendent of the Capitol Buildings and Grounds toward removing the buildings thereon, and they have accordingly been rented as far as practicable at nominal rates.

Paragraph (e), section 1, of the act of May 16, 1918, entitled "An act to authorize the President to provide housing for war needs," is as follows:

(e) To take possession of, alter, repair, improve, and suitably arrange for living purposes, to be used under the terms of this act, all houses on square 633 except the Maltby Building, owned by the United States, together with any other houses in the District of Columbia owned by the Government and not now occupied. The President shall, in the construction of buildings in the District of Columbia, make use of any lands owned by the Government of the United States deemed by him to be suitable for the purpose and which have not heretofore been dedicated by act of Congress for specific buildings.

In October of 1918, on the request of the president of the United States Housing Corporation, acting for the Secretary of Labor, all of the houses in square 633, bounded by New Jersey Avenue, B and C Streets NW., were turned over to that corporation to be repaired for occupancy under the provisions of the above-mentioned act, and improvements aggregating a total cost of \$23,829.40 were made by the Housing Corporation to 11 of the houses in this square to wit: Nos. 210, 212, 214, 216, 220, 222, 224, and 226 New Jersey Avenue NW., Nos. 46 and 48 C Street NW., and No. 235 Arthur Place NW.

In March, 1919, the Housing Corporation returned all of the buildings in square 633 to the Interior Department, and since March 5, 1919, the department has collected the rent from said houses.

In April, 1920, the department, being desirous of readjusting the rents paid for said houses, had an examination made of them by an inspector, and from his report as to the general conditions thereof it appeared that there should be increases of rentals made in some cases and decreases in others.

Accordingly, on April 25, 1920, all the facts in the case were brought to the attention of the Rent Commission of the District of Columbia, provided for in the act approved October 22, 1919 (41 Stats., 297), and an expression of its views was requested as to what would be a fair and reasonable rate to be exacted for each of the houses in said square, considering the interests of the Government as well as those of the lessees and the condition of the buildings.

Subsequently, at the suggestion of the commission, formal petitions in each of the cases were filed with the commission May 1, 1920; thereafter the several cases were duly heard, and on August 25, 1920, a determination was reached by the commission increasing the rates of rental to be paid in 18 cases, and reducing the rate in 6 cases.

New contracts were thereafter entered into with the lessees, providing for the payment from October 1, 1920, of the rates as determined by the commission in all except 2 cases which are still pending.

The amount collected for rents from these houses between December 1, 1919, and November 1, 1920, aggregating \$2,659.30, has been deposited in the Treasury to the credit of miscellaneous receipts. A special report on the subject will hereafter be submitted to Congress.

The report as to the collection of rents between March 5, 1919, and December 1, 1919, was submitted to Congress December 3, 1919, and printed as House Document 475 (66th Cong., 2d sess.).

AMERICAN ANTIQUITIES.

The act of June 8, 1906, entitled "An act for the preservation of American antiquities," provides, among other things:

SEC. 3. That permits for the examination of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdiction may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, That the examinations, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this act.

Archæological explorations.—The uniform rules and regulations promulgated by the Secretaries of the Interior, Agriculture, and War pursuant to the above-mentioned act, under date of December 28, 1906, provide (par. 3) that—

Permits for the excavation of ruins, the excavation of archæological sites, and the gathering of objects of antiquity will be granted by the respective Secretaries having jurisdiction to reputable museums, universities, colleges, or other recognized scientific or educational institutions, or to their duly authorized agents.

During the year 13 permits were granted for the examination, excavation, and gathering of specimens, as follows:

July 15, 1919, to Prof. Levi Edgar Young, for the University of Utah, work to be performed under the personal direction of Mr. Andrew Kerr, of Harvard University (now associated with the University of Utah), to conduct archæological investigations and make excavations of ruins 7 miles up Arunuweap Canyon from the junction of Zion Creek and Virgin River, Washington County, Utah, and also to make excavations in the Cottonwood Canyon, 7 miles from Kanab, Utah, west and south from Rigby Ranch, subject to the prior right of the Smithsonian Institution, represented by Mr. Neil M. Judd, of the United States National Museum, to which permit was granted May 16, 1919, covering in part that portion of Utah lying within Kane and Garfield Counties.

October 24, 1919, to Dr. Henry L. Ward, director, Public Museum of the city of Milwaukee, or his authorized agent, Mr. Arthur J. Ivens, to collect cliff dwellers' and pueblo remains and specimens in the area between Flagstaff, Ariz., and Marysvale, Utah, between October 27, 1919, and June 30, 1920, such collections to be deposited in the Public Museum of the city of Milwaukee.

On October 16, 1919, with the approval of the department, the following warning, to be posted on and in the vicinity of ruins located on public lands, was issued by the Commissioner of the General Land Office, to wit:

WARNING.

This ancient ruin is located on public land. It belongs to you—help protect it.

All persons are warned that it is unlawful to remove any object from, excavate upon, damage, destroy, or remove any portion of an ancient ruin located on lands owned and controlled by the Government of the United States, except under permit issued in accordance with the act of Congress approved June 8, 1906 (34 Stat., 225); that any person violating this law may be arrested by an officer of the United States, and may be fined not more than \$500 or imprisoned for not more than 90 days, or may suffer both fine and imprisonment, in the discretion of the court. Help preserve for the future the records of the past.

January 26, 1920, to Dr. W. J. Holland, director of the Carnegie Museum, Pittsburgh, Pa., to conduct excavations and gather such fossils and objects of scientific interest as may be desired during the season of 1920 within the Dinosaur National Monument, Utah; all work under this permit to be conducted under the general supervision of the director of the Carnegie Museum, who shall have the right to designate persons experienced in archæological research to carry on the work.

February 27, 1920, to the Museum of the American Indian (Heye Foundation), Broadway, New York City (renewal), to continue during the field season of 1920 to conduct archæological investigations in and gather collections from the ruined pueblo of Hawikuh and the ruin known to the Zuni Indians as "Kechipauan," on the mesa above their village of Ojo Caliente, about 3 miles from Hawikuh, both ruins being situate on the Zuni Indian Reservation in western New Mexico; the work to be conducted under the immediate supervision of Mr. F. W. Hodge, of the Museum of the American Indian, and the collections gathered to be deposited in said museum; permit is not exclusive, and in case the Smithsonian Institution should desire to have the National Museum conduct explorations in this Indian reservation the work must not conflict with any that may be executed by the representative of the Smithsonian Institution.

March 20, 1920, to Dr. Robert F. Gilder, in behalf of the University of Nebraska, to make examination and gatherings of specimens, but chiefly preliminary reconnoissance for archæological purposes, of public lands and Indian reservations in Gila, Graham, Yuma, Maricopa, Pinal, Pima, and Cochise Counties, Ariz.; permit is not exclusive, nor does it authorize the making of excavations or explorations in the Casa Grande Ruin in Pinal County, as excavations in this reservation are only authorized to be made by employees of the United States.

March 27, 1920, to the United States National Museum, acting through Mr. Neil M. Judd, curator of archæology, to make archæological reconnoissance of that portion of Arizona north of the Rio Colorado and that portion of Utah lying within Kane and Garfield Counties, during the field season of 1920.

April 6, 1920, to the Peabody Museum of Harvard University, to conduct archæological researches and gather collections during the field season of 1920 in Chin Lee Canyon and the adjacent region in northeastern Arizona.

April 9, 1920, to Gilbert Grosvenor, president, National Geographic Society, Washington, D. C., for said society to conduct archæological investigations within the limits of the Chaco Canyon, N. Mex., during 1920, upon condition that the reconnoissance work is to be supervised by competent persons approved by the Secretary of the Smithsonian

Institution, and upon the further condition that any specimens acquired as a result of such research shall be deposited in the United States National Museum; this permit also covers the privilege of making such excavations as may be necessary to determine where and how more intensive subsequent investigations should be undertaken, if at all, and to be renewable at the end of the 1920 season if the results of the investigation warrant continuance of the research work; the excavations, however, are not to interfere with actual archaeological excavations or restorations which may be performed under any permits granted during the present calendar year to other scientific institutions to conduct work in the Chaco Canyon.

May 27, 1920, to Dr. R. B. von Kleinsmid, president, University of Arizona, to make archaeological excavations in and gather collections from ruins in Sagie Canyon (Laguna Creek) and vicinity, and in Monument Park, Ariz., during the field season of 1920.

May 28, 1920, to Dr. R. B. von Kleinsmid, president, University of Arizona, to make archaeological excavations in and gather collections from the two pueblos located southwest of Navajo Mountain, Ariz., near its base and in cave ruins that may be found in the vicinity during the field season of 1920, the work to be performed under the personal supervision of Dr. Byron Cummings, director of the Arizona State Museum.

May 29, 1920, to Dr. Edgar L. Hewett, director, School of American Research and State Museum, Santa Fe, N. Mex., to conduct archaeological explorations in the Chaco Canyon National Monument, N. Mex.; to excavate the ruin known as "Chettro Kettle," situate in sec. 12, Tp. 21 N., R. 11 W., Navajo meridian, or such other location therein as may be hereafter determined, provided that the excavations under this authority will not conflict with the reconnaissance work in this national monument which the National Geographic Society was authorized to conduct; permit issued for one year, with the understanding that it will be renewable if satisfactorily performed in the judgment of the Secretary of the Smithsonian Institution.

May 29, 1920, to the United States National Museum, Smithsonian Institution, acting through Dr. Walter Hough, curator of ethnology, to conduct archaeological explorations and gather specimens in the White Mountain Apache and the Hopi Indian Reservations, Ariz.

October 12, 1920, to Dr. Clark Wissler, American Museum of Natural History, New York City, to conduct excavations and gather collections in that portion of the Navajo country, San Juan Indian Reservation, N. Mex., bounded on the northeast by the immediate valley of the San Juan River, on the east by the Chaco Valley, on the southwest by the Chioska and Tunicha Mountains, and on the northwest by the western skirt of Carriso Mountain, it being under-

stood that special attention is to be given to sites in the San Juan Valley near Shiprock, N. Mex., and at Bennetts Peak, 30 miles south of Shiprock; permit valid for the remainder of the 1920 season and also during the season of 1921; collections to be deposited in the American Museum of Natural History; expedition to be under immediate charge of Mr. Earl H. Morris, a regular member of the scientific staff of said institution.

GENERAL EDUCATION BOARD.

This corporation, which was created by the act of Congress approved January 12, 1903, section 6 of which requires the corporation to annually file with the Secretary of the Interior a report, in writing, stating in detail the property, real and personal, held by the corporation, and the expenditure or other use or disposition of the same or the income thereof during the preceding year, has for its object the promotion of education within the United States. The corporation owns real estate amounting to \$359,169.09, the rest of its property consisting of securities and money divided into various funds, according to the purpose for which it is to be used.

On June 30, 1920, the principal funds, not including the above-mentioned real estate, belonging without restriction to the board, amounted to \$107,601,887.06, invested in stocks and bonds. Of this sum \$21,272,286 was appropriated during the year, but on June 30, 1920, no payments had yet been made thereon.

The income from the above funds, together with the income from undisbursed income, amounted during the year to \$4,741,223.66. The balance of income from previous year as of June 30, 1919, amounting to \$10,018,625.85, increased the total to \$14,759,849.51.

Disbursements from income during the year were as follows:

For whites:

Colleges and schools.....	\$1,680,317.43
Medical schools.....	525,625.00
Professors of secondary education.....	42,512.94
Rural-school agents.....	76,373.34
Lincoln School.....	115,000.00
Lincoln School site and building.....	359,169.09
Taxes on Lincoln School property.....	3,373.02
State agents for secondary education.....	6,798.50
Increase in salaries of State agents.....	10,874.99
Consolidated rural schools.....	8,000.00
Yale University.....	29,145.00
Lafayette College.....	257.72
University of Chicago.....	37,602.73

For Negroes:

Colleges and schools.....	242,625.00
Medical schools.....	7,500.00
Rural-school agents.....	71,780.57

Summer schools	\$9,350.00
County training schools	38,383.68
Home-makers' clubs	35,180.52
Expenses special students at summer schools	15,885.49
Scholarships	3,000.00
Negro rural-school fund	56,700.00
John F. Slater fund	4,500.00
Critic teachers	4,950.00
Miscellaneous:	
General survey of educational conditions and needs in North Carolina	11,495.08
General survey of educational conditions and needs in Virginia	3,336.90
Survey for preparation of mental measurements of school children	19,123.96
Model county organization	6,920.01
Conferences	2,074.27
National committee on mathematical requirements	16,021.60
Educational investigation and research	11,287.31
Vocational arts survey	26,363.90
Division of educational relations	4,427.28
Administration expense	166,822.68
Total	3,652,777.99

This leaves an undisbursed balance of income on June 30, 1920, of \$11,107,071.52, which is invested as follows: Bonds and stocks, \$8,071,108.88; cash, \$180,012.49; moneys loaned, \$2,800,000; accounts receivable, net, \$55,950.15. It should be noted, however, that against this balance there are unpaid appropriations amounting to \$11,291,648.06..

The Anna T. Jeanes fund, the income to be used for Negro rural schools, amounts to \$200,147.14. It is invested as follows: Bonds, \$164,355; stocks, \$35,645; cash, \$1,100. The income from this fund during the year was \$9,433.20. Added to the balance from the previous year, the total available income amounted to \$15,831.62. Of this, \$8,788.59 was appropriated and paid to various schools, leaving a balance of \$7,043.03 in cash.

FUEL ADMINISTRATION RECORDS.

Congress failed to make an appropriation for the continuance of the work of the Fuel Administration, and the force was disbanded June 30, 1919. Accordingly, on July 22, 1919, the following Executive order was issued:

Under the provisions of the act of Congress making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1920, and for other purposes, approved July 19, 1919, it is hereby ordered that the records, files, and property of the United States Fuel Administration created by Executive order of August 23, 1917, be transferred to the Department of the Interior,

and the Secretary of the Interior is hereby designated as custodian to receive said records, files, and property.

Thereafter the following plan for the disposition of the records, files, and property of the administration was adopted, to wit:

All Fuel Administration publications to be transferred to the superintendent of documents for distribution under the direction of the publication division of the department, and all mimeographed circulars transferred to the publication division for distribution.

The library of the Fuel Administration to be transferred to the Department of the Interior library.

All surplus supplies and equipment to be transferred to the General Supply Committee.

All records and files to be consolidated and remain in the Fuel Administration Building.

A physical inventory of all property and supplies to be taken.

This plan was effectuated, and a complete inventory of all property transferred to the department was taken, and surplus supplies and equipment to the value of \$63,000 were transferred to the General Supply Committee of the Treasury Department. The files and records were collected from the various rooms and placed in the third wing, first floor, of the Fuel Administration Building, Twentieth Street and Virginia Avenue NW., where they were consolidated and arranged.

As custodian of the Fuel Administration records, the department was required to consider and answer numerous requests for information as to Fuel Administration orders, rulings, diversions, personnel, and other miscellaneous matters, and furnish certified copies of various orders and circulars, but was without any authority to adjust outstanding claims. To meet this condition, as far as practicable, on March 20, 1920, the following Executive Order was issued:

By virtue of the authority vested in me by the act of Congress entitled "An act authorizing the President to coordinate or consolidate executive bureaus, agencies, and offices, and for other purposes, in the interest of economy and the more efficient concentration of the Government," approved May 20, 1918 (40 Stat., 556), as well as by virtue of any and all other acts of Congress conferring authority upon me in the premises, I hereby order and direct:

That the Secretary of the Interior is hereby authorized and directed to adjust, liquidate, and pay all claims against the United States Fuel Administration, payment to be made from the appropriations made by the act of April 17, 1917 (40 Stat., 2-28), for the national defense, as extended by the act of December 15, 1917 (40 Stat., 429); sections 18 and 19 of the act of August 10, 1917 (40 Stat., 276); the act of March 21, 1918 (40 Stat., 458-461), "United States Food and Fuel Administrations"; the act of July 1, 1918 (40 Stat., 634-635), national defense—page 648, Fuel Administration and any other appropriation which is or which may become available for such purpose.

On March 23, 1920, the services of the former disbursing officer of the Fuel Administration were secured and he was placed in the

immediate charge of the work required under the Executive Order, five of the employees of the department being detailed to assist in the work of liquidation. The following table indicates the work which was accomplished up to November 1, 1920:

Number of letters received not accounting for those on hand Mar. 20, 1920.....	833
Number of letters written.....	856
Number of established claims (vouchers) approved and forwarded to the Auditor for the State and Other Departments for settlement.....	509
Amount for which approved.....	\$84, 392. 25
Number of telegrams included in vouchers to auditor.....	43, 725
Number of freight and express shipments included in vouchers to auditor.....	329
Number of Government transportation requests included in vouchers to auditor.....	1, 056

The Division of Publications of the Secretary's office, in addition to reading proof of publications of the Fuel Administration in process of being printed, received and answered 444 letters, prepared 22,007 labels for mailing such publications, and distributed 24,580 publications. The manuscript of the final report of the Fuel Administration has not been received.

Since the date of the Executive order of July 22, 1919, the following reports and publications of the Fuel Administration have been printed: Report of the engineers' committee. Report of the Distribution Division: Part I, Coal and Coke; Part II, Zone System; and Part III, Statistical Tables. Report of the Administrative Division, Part I. Report of the Administrative Division separates for each State. Report of the business manager. General orders, rulings, and regulations, revised to March 20, 1920. Supplement to general orders, rulings, and regulations from January 1, 1919, to March 20, 1920.

Under the Executive order of March 20, 1920, the authority of the Secretary is limited to the settlement of claims involving the operating expenses of the Fuel Administration, such as salaries, traveling expenses, and purchases, which had been specifically authorized by the Fuel Administration. Many claims were presented on account of losses incurred by reason of the carrying out of orders and regulations of the Fuel Administrator and others of various natures which can not be adjusted without specific authority from Congress.

THE CHIEF CLERK OF THE DEPARTMENT.

As chief executive officer of the department and administrative head of the office of the Secretary, the chief clerk, during the temporary absence of the Secretary and the Assistant Secretaries, is designated to sign official papers and documents; he has supervision

over the employees, including the watch, mechanical, and labor forces; enforces the general regulations of the department, and is superintendent of its several buildings. He also supervises the classification and compilation of all estimates of appropriations, and has general supervision over expenditures of appropriations for contingent expenses, including repairs to the buildings, stationery, postage, and mail addressed to postal unions. In addition to his other duties during the past year he was required to serve on various committees, the most important of which was the advisory committee on employment policy on reclassification of salaries, and was one of a committee of three for the drafting of a definite plan in connection with the retirement of Federal employees. His report, which embodies a very comprehensive review of the work of his office, shows that during the past five years the work has increased proportionately with the vast expansion of the several bureaus. The mail for supervision and action has trebled; the responsibility incident to the proper disposition of departmental funds and the securing of appropriations sufficient for the maintenance and upkeep of the buildings and offices have become serious economical problems. Aside from the weightier matters requiring time and careful consideration, he must confer upon appointments and discharges, settle disputes, and frequently advise and direct personal and semiofficial matters, so that his office has become virtually a combined clearing house, courtroom, and bureau of general information.

The Government-owned buildings under his supervision are the Interior Department Building, Eighteenth and F Streets NW.; the Patent Office Building, Seventh and F Streets NW.; the old General Land Office Building, Seventh and E Streets NW.; and the Pension Office Building, Judiciary Square, G Street between Fourth and Fifth Streets NW., the value of the buildings and the land on which the same are located being \$13,581,872, and the appraised value of the stock and equipment \$1,694,015.61.

In addition, the first floor of premises 627 and 629 G Street is rented for the purpose of housing and repairing trucks and motor vehicles used in the delivery of the department's mail, freight and express, etc., the front portion being used as the department garage and the rear for the storage of Patent Office models. It has been practicable, notwithstanding the difficulty experienced in obtaining necessary mechanical and labor help and the increased cost of supplies and equipment, to operate these buildings at the following relatively low figures, to wit: The Interior Department, containing 684,506 square feet of floor space, at 26.42 cents per square foot; the Patent Office Building, containing 246,244 square feet of floor space, at 31.5 cents per square foot; the General Land Office Building, containing

140,118 square feet of floor space, at 30.1 cents per square foot; and the Pension Office Building at a cost of 26.7 cents per square foot.

In May, 20 members of the Building Owners and Managers' Association from New York, Philadelphia, and Baltimore visited Washington for the purpose of becoming acquainted with governmental management and care of buildings, particularly those under the Interior Department. There was a general expression of surprise at the businesslike methods prevailing in this department, especially with respect to modern appliances, labor-saving devices and equipment, and the hygienic condition of the buildings. Their visit was followed by personal letters and articles published in the association's magazine expressing the favorable impressions made upon them.

The establishment of the Government fuel yards, which was first authorized in 1918, was the result of the personal endeavors of the chief clerk, who foresaw the practicability and eventual necessity for such an organization; he has general supervision over and is immediately responsible for the purchase of all supplies for the yards. This branch of the service furnishes all the fuel for the Federal and District Government departments in and about the District of Columbia, with the exception of the navy yard. During the year there were delivered approximately 275,000 tons of coal to 725 distributing points. The statistics accompanying the report as to the cost of operating the yard, the fleet of 33 trucks of varying tonnage capacities, the garage, and machine shop show a material saving to the Government in meeting its coal requirements as compared with the old practice of purchasing and handling coal and wood under separate contracts by the different branches of the service. The representative of the department on the General Supply Committee is required to submit reports on the progress of the work of purchasing and is subject to the chief clerk's instructions in this connection. It was due to the latter's endeavors when he was a representative of the department on that committee and to his continued efforts since that measures have been taken looking to the creation of a supply bureau. In discussing this matter he states that:

While it is commendable to use the supplies of other departments, the method of obtaining them is cumbersome and the delays incident to receipt frequently embarrass the service in handling this emergency work. Such conditions could be obviated if the Government would adopt modern methods, which could be accomplished by creating a central purchasing agency to take over all articles not used by the departments and distributing them as needed. Centralization of purchase and distribution of supplies have been urged by this department for a number of years. Senate bill No. 4481, Sixty-sixth Congress, second session, if enacted into law, would accomplish this purpose and result in a material saving in eliminating duplication of supplies; it would make available for office space storerooms now being used in all the departments and reduce the personnel of the various purchasing offices from 25 to 50 per cent.

In discussing the personnel of the department the chief clerk, in closing his report, states that :

Not only this department but the entire Government service—the largest of all business organizations—is laboring under some of the most serious disadvantages, the greatest handicap being the impossibility to secure efficient help without adequate compensation. In the technical and scientific branches men are specially trained who render exceptional service, but they are a class devoted to duty and compensation is a secondary consideration. The great body of Government employees, who qualify through minor civil-service examinations, find the environments of official life in Washington novel and attractive, and at first they enjoy freedom from responsibility. Gradually the laws, rules, and regulations governing their work take away all incentive to think or act independently, with the inevitable result they fall into the proverbial “rut.” Finally having grown old in the service, they become dissatisfied, but are powerless to better their condition. This could and should be obviated by placing the whole Government service on a par with the Army and Navy, advancing in grade on merit only. Along such lines, entrance should be through rigid examination to prove the fitness of the applicant for definite lines of work incidental to Government business, in which they should receive thorough training in at least the rudiments of Government activities. They should be advanced according to their knowledge, integrity, adaptability, initiative, and energy. On the other hand, Government conditions and compensation should be such as to afford its employees encouragement and opportunity to carve enviable careers out of the honorable discharge of their duties. The strain the department labored under during the late war brought out more prominently than ever before the splendid traits and fine qualities of our people, and I take pleasure in saying that, given the opportunity and fair compensation which should be afforded every earnest worker, the employees of the Interior Department, as a whole, are well worthy of whatever favorable consideration Congress may extend to them.

MARITIME CANAL CO. OF NICARAGUA.

Section 6 of the act of Congress approved February 20, 1889, entitled “An act to incorporate the Maritime Canal Co. of Nicaragua” (25 Stat., 675), provides:

Said company shall make a report on the first Monday of December in each year to the Secretary of the Interior, which shall be duly verified on oath by the president and secretary thereof, giving such detailed statements of its affairs and of its assets and liabilities as may be required by the Secretary of the Interior, and any willfully false statements so made shall be deemed perjury and punishable as such. And it shall be the duty of the Secretary of the Interior to require such annual statement and to prescribe the form thereof and the particulars to be given thereby.

It is not likely that any report will be rendered by this corporation, as the department has been advised that there is no longer any organization of the Maritime Canal Co., and there are no offices of that company so far as can be ascertained.

APPENDIX A.

LAND CLASSIFICATION.

Land classification, with progress of coal classification and valuation.

STATUS ON JULY 1, 1919.

State.	Withdrawals outstanding.	Coal lands classified and appraised.	Valuation.	Valuation at minimum price.
	<i>Acres.</i>	<i>Acres.</i>		
Arkansas.....	141,945	60,715	\$1,473,762	\$1,214,280
Arizona.....	17,643	7,720	585,086	154,404
California.....	4,500,511	2,881,494	195,531,620	51,486,154
Colorado.....	4,761	4,603	89,624	79,080
Idaho.....	10,612,032	5,783,336	137,410,916	121,654,418
Montana.....	83,833	6,803	126,830	117,600
Nevada.....	5,585,208	666,205	16,392,111	8,085,468
New Mexico.....	10,902,615	11,409,769	199,382,266	208,519,859
North Dakota.....	4,631	7,195	174,843	117,729
Oregon.....		244,874	2,711,462	2,711,462
South Dakota.....	5,313,836	1,069,871	45,101,333	14,565,447
Utah.....	824,074	1,866	38,520	37,320
Washington.....	2,437,723	7,238,635	387,820,153	108,389,185
Wyoming.....				
Total.....	40,428,542	29,383,086	986,838,526	512,082,386

STATUS ON JULY 1, 1920.

Arkansas.....		60,715	\$1,473,762	\$1,214,280
Arizona.....	141,945			
California.....	17,643	7,720	585,086	154,404
Colorado.....	4,493,507	2,885,137	196,199,767	51,559,014
Idaho.....	4,761	4,603	89,624	79,080
Montana.....	10,612,923	5,781,986	137,560,606	121,624,238
Nevada.....	83,833	6,803	126,830	117,600
New Mexico.....	5,585,208	657,428	16,198,961	7,947,698
North Dakota.....	10,386,439	11,409,849	199,383,866	208,521,459
Oregon.....	4,361	7,195	174,843	117,729
South Dakota.....		244,874	2,711,462	2,711,462
Utah.....	5,313,836	1,069,871	45,101,333	14,565,447
Washington.....	823,434	2,706	88,360	54,120
Wyoming.....	2,437,723	7,239,065	387,794,213	108,397,785
Total.....	39,906,613	29,377,942	987,488,793	512,064,296

Withdrawals and restorations, fiscal year 1920.

OIL LAND.

State.	Withdrawals outstanding July 1, 1919.	Fiscal year ended June 30, 1920.		Withdrawals outstanding July 1, 1920.
		Withdrawals.	Restorations.	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	230,400			230,400
California.....	1,257,229			1,257,229
Colorado.....	222,977			222,977
Louisiana.....	467,030			467,030
Montana.....	1,351,891		954	1,350,937
North Dakota.....	84,894			84,894
Utah.....	1,962,787			1,962,787
Wyoming.....	1,181,626			1,181,626
Total.....	6,758,834		954	6,757,880

POTASH LAND.

California.....	90,607		89	90,518
Nevada.....	39,422			39,422
Total.....	130,029		89	129,940

POWER SITES.

Alabama.....	120			120
Alaska.....	81,015	10,000		91,015
Arkansas.....	22,354			22,354
Arizona.....	295,848	6,360		302,208
California.....	288,894	4,152		293,046
Colorado.....	277,136	12,111	22,793	266,454
Idaho.....	258,473	1,925	2,007	258,391
Michigan.....	1,240			1,240
Minnesota.....	12,309			12,309
Montana.....	164,431	789	8,579	156,641
Nevada.....	27,543			27,543
Nebraska.....	761			761
New Mexico.....	62,602	2,970		65,572
Oregon.....	422,744	16,714	7,112	432,346
Utah.....	448,698	6,880	475	455,103
Washington.....	113,248	888		114,136
Wyoming.....	88,311	65		88,376
Total.....	2,565,727	62,854	40,966	2,687,615

PUBLIC WATER RESERVES.

Arizona.....	13,826	335	160	14,001
California.....	56,084	3,812	85	59,761
Colorado.....	1,900			1,900
Idaho.....	7,040	3,600		10,640
Montana.....	7,284	440		7,724
Nevada.....	4,833	2,020		6,853
New Mexico.....	3,361	2,680		6,041
Oregon.....	11,744	640		12,384
South Dakota.....	240			1,240
Utah.....	34,867	720		35,587
Washington.....	800	120		920
Wyoming.....	83,752		520	83,232
Total.....	225,681	14,367	765	239,283

Withdrawals and restorations, fiscal year 1920—Continued.

RESERVOIR-SITE RESERVES.

State.	Withdrawals outstanding July 1, 1919.	Fiscal year ended June 30, 1920.		Withdrawals outstanding July 1, 1920.
		Withdrawals.	Restorations.	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	23,040	.....	.....	23,040
Colorado.....	1,728	.....	.....	1,728
Montana.....	9,080	.....	.....	9,080
North Dakota.....	1,569	.....	.....	1,569
Oregon.....	10,619	.....	.....	10,619
Washington.....	35,943	.....	.....	35,943
Wyoming.....	.....	1,714	.....	1,714
Total.....	81,979	1,714	.....	83,693

Summary of enlarged-homestead designations, fiscal year 1919-20, in acres.

State.	Outstanding July 1, 1919.	Designations 1919-20.	Cancellations 1919-20.	Outstanding June 30, 1920.
Arizona.....	25,489,483	10,880	4,040	25,496,323
California.....	8,415,241	410,495	.....	8,825,736
Colorado.....	28,778,359	419,075	5,100	29,192,274
Idaho:				
Sections 1-5 and 7.....	10,319,499	206,540	24,907	10,501,132
Section 6.....	516,237	28,957	160	545,034
	10,835,736	235,497	25,067	11,046,166
Kansas.....	548,754	23,720	.....	572,474
Montana.....	50,665,908	492,125	600	51,157,431
Nevada.....	46,304,756	51,702	2,960	46,358,498
New Mexico.....	31,519,989	639,774	.....	32,159,763
North Dakota.....	11,910,717	32,125	.....	11,942,842
Oregon.....	18,938,987	641,148	2,400	19,577,735
South Dakota.....	15,901,760	174,795	348,170	15,728,385
Utah:				
Sections 1-5 and 7.....	7,684,195	215,080	32,180	7,867,095
Section 6.....	1,424,274	79,340	600	1,503,014
	9,108,469	294,420	32,780	9,370,109
Washington.....	5,566,658	466,205	160	6,032,703
Wyoming.....	24,812,426	661,615	.....	25,474,042
Total.....	288,797,241	4,583,577	421,337	392,959,481

Summary of stock-raising homestead designations, fiscal year 1919-20, in acres.

State.	Outstanding July 1, 1919.	Designations 1919-20.	Cancellations 1919-20.	Outstanding June 30, 1920.
Arizona.....	291,120	2,151,950	.....	2,443,070
Arkansas.....	240	.....	.....	240
California.....	365,380	3,896,586	.....	4,261,966
Colorado.....	2,674,964	2,800,757	40	5,475,681
Idaho.....	445,389	2,418,425	.....	2,863,814
Kansas.....	57,604	31,070	.....	88,674
Michigan.....	.....	320	.....	320
Montana.....	2,401,790	5,977,437	.....	8,379,227
Nebraska.....	38,648	56,700	.....	95,408
Nevada.....	28,960	102,039	.....	131,019
New Mexico.....	5,083,090	17,670,063	.....	22,753,153
North Dakota.....	191,418	110,441	.....	301,859
Oklahoma.....	22,481	.....	.....	22,481
Oregon.....	1,040,907	4,288,134	320	5,323,721
South Dakota.....	1,782,525	4,415,582	.....	6,198,107
Utah.....	52,410	511,950	.....	564,360
Washington.....	207,536	123,758	.....	331,294
Wyoming.....	5,497,366	9,762,316	1,760	15,257,942
Total.....	20,181,868	54,312,588	2,120	74,492,336

APPENDIX B.

National parks administered by the National Park Service—National park statistics.

[Number, 19; total area, 10,859 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Area in square miles.	Distinctive characteristics.
*Hot Springs..... 1832	Middle Arkansas.	Apr. 20, 1832	1½	46 hot springs possessing curative properties—Many hotels and boarding houses—20 bathhouses under public control.
*Yellowstone..... 1872	Northwestern Wyoming, southwestern Montana, and northeastern Idaho.	Mar. 1, 1872	13,348	More geysers than in all rest of world together—Boiling springs—Mud volcanoes—Petrified forests—Grand Canyon of the Yellowstone, remarkable for gorgeous coloring—Large lakes—Many large streams and waterfalls—Vast wilderness, greatest wild bird and animal preserve in the world—exceptional trout fishing.
*Sequoia..... 1890	Middle eastern California.	Sept. 25, 1890	252	The Big Tree National Park—12,000 sequoia trees over 10 feet in diameter, some 25 to 36 feet in diameter—Towering mountain ranges—Startling precipices—Cave of considerable size.
*Yosemite..... 1890	do.....	Oct. 1, 1890	1,125	Valley of world-famed beauty—Lofty cliffs—Romantic vistas—Many waterfalls of extraordinary height—3 groves of big trees—High Sierra—Waterwheel Falls—Good trout fishing.
*General Grant..... 1890	do.....	do.....	4	Created to preserve the celebrated General Grant Tree, 35 feet in diameter—6 miles from Sequoia National Park.
*Mount Rainier... 1899	West central Washington.	Mar. 2, 1899	324	Largest accessible single peak glacier system—28 glaciers, some of large size—48 square miles of glacier, 50 to 500 feet thick—Wonderful subalpine wild flower fields.
*Crater Lake..... 1902	Southwestern Oregon.	May 22, 1902	249	Lake of extraordinary blue in crater of extinct volcano—Slides 1,000 feet high—Interesting lava formation—Fine fishing.
*Wind Cave..... 1903	South Dakota.	Jan. 9, 1903	17	Cavern having many miles of galleries and numerous chambers containing peculiar formations.
Flat..... 1904	Southern Oklahoma.	{ July 1, 1902 Apr. 21, 1904 }	1½	{ Many sulphur and other springs possessing medicinal value.
Sullys Hill..... 1904	North Dakota.	Apr. 27, 1904	1½	{ Small park with woods, streams, and a lake—Is an important wild animal preserve.
*Mesa Verde..... 1906	Southwestern Colorado.	{ June 29, 1906 June 30, 1913 }	77	{ Most notable and best preserved prehistoric cliff dwellings in United States, if not in the world.
*Glacier..... 1910	Northwestern Montana.	May 11, 1910	1,534	Rugged mountain region of unsurpassed Alpine character—250 glacier-fed lakes of romantic beauty—60 small glaciers—Precipices thousands of feet deep—Almost sensational scenery of marked individuality—Fine trout fishing.
*Rocky Mountain... 1915	North middle Colorado.	{ Jan. 26, 1915 Feb. 14, 1917 }	397½	{ Heart of the Rockies—Snowy range, peaks 11,000 to 14,255 feet altitude—Remarkable records of glacial period.
Hawaii..... 1916	Hawaii.....	Aug. 1, 1916	118	Three separate areas—Kilauea and Mauna Loa on Hawaii; Haleakala on Maui.
*Lassen Volcanic... 1916	Northern California.	Aug. 9, 1916	124	Only active volcano in United States proper—Lassen Peak 10,465 feet—Cinder cone 6,879 feet—Hot Springs—Mud geysers.
Mount McKinley... 1917	South central Alaska.	Feb. 26, 1917	2,200	Highest mountain in North America—Rises higher above surrounding country than any other mountain in the world.
*Grand Canyon... 1919	North central Arizona.	Feb. 26, 1919	958	The greatest example of erosion and the most sublime spectacle in the world.
*Lafayette..... 1919	Maine coast.....	do.....	8	The group of granite mountains upon Mount Desert Island.
Zion..... 1919	Southwestern Utah.	Nov. 19, 1919	120	Magnificent gorge (Zion Canyon) depth from 800 to 2,000 feet, with precipitous walls—Of great beauty and scenic interest.

¹ In Wyoming, 3,114 square miles; in Montana, 198 square miles; in Idaho, 36 square miles.

* General information circulars on these parks may be obtained free on application.

† Boundary changed.

National monuments administered by the National Park Service.

(Number, 24; total area, 1,815 square miles; chronologically in order of creation.)

Name.	Location.	Date of proclamation.	Area (acres).	Description.
Devils Tower....	Wyoming.....	Sept. 24, 1906	1,152	Remarkable natural rock tower, of volcanic origin, 1,200 feet in height.
Montezuma Castle	Arizona.....	Dec. 8, 1906	160	Prehistoric cliff-dwelling ruin of unusual size situated in a niche in face of a vertical cliff. Of scenic and ethnological interest.
El Morro.....	New Mexico...	{do.....}	240	Enormous sandstone rock eroded in form of a castle, upon which inscriptions have been placed by early Spanish explorers. Contains cliff-dweller ruins. Of great historic, scenic, and ethnologic interest.
Petrified Forest..	Arizona.....	{Dec. 8, 1906 July 31, 1911}	25,625	Abundance of petrified coniferous trees, one of which forms a small natural bridge. Is of great scientific interest.
Chaco Canyon....	New Mexico...	Mar. 11, 1907	20,629	Numerous cliff-dweller ruins, including communal houses, in good condition, and but little excavated.
Muir Woods *....	California.....	Jan. 9, 1908	295	One of the most noted redwood groves in California, and was donated by Hon. William Kent, Member of Congress. Located 7 miles from San Francisco.
Pinnacles.....	do.....	Jan. 16, 1908	2,080	Many spirelike rock formations, 600 to 1,000 feet high, visible many miles; also numerous caves and other formations.
Natural bridges..	Utah.....	{Apr. 16, 1908 Sept. 25, 1909 Feb. 11, 1916}	2,740	Three natural bridges, among largest examples of their kind. Largest bridge is 222 feet high, 65 feet thick at top of arch; arch is 28 feet wide; span, 261 feet; height of span, 157 feet. Other two slightly smaller.
Lewis & Clark Cavern. ¹	Montana.....	{May 11, 1908 May 16, 1911}	190	Immense limestone cavern of great scientific interest, magnificently decorated with stalactite formations. Now closed to public because of depredations by vandals.
Tumacacori.....	Arizona.....	Sept. 15, 1908	10	Ruin of Franciscan mission dating from seventeenth century. Being restored by National Park Service as rapidly as funds permit.
Navajo.....	do.....	{Mar. 20, 1909 Mar. 14, 1912}	360	Contains numerous pueblo, or cliff-dweller ruins, in good preservation.
Shoshone Cavern.	Wyoming.....	Sept. 21, 1909	210	Cavern of considerable extent, near Cody.
Gran Quivira....	New Mexico...	{Nov. 1, 1909 Nov. 25, 1919}	560	One of the most important of earliest Spanish mission ruins in the Southwest. Monument also contains pueblo ruins.
Sitka.....	Alaska.....	Mar. 23, 1910	157	Park of great natural beauty and historic interest as scene of massacre of Russians by Indians. Contains 16 totem poles of best native workmanship.
Rainbow Bridge.	Utah.....	May 30, 1910	160	Unique natural bridge of great scientific interest and symmetry. Height 309 feet above water, and span is 278 feet, in shape of rainbow.
Colorado.....	Colorado.....	May 24, 1911	13,883	Many lofty monoliths, and is wonderful example of erosion, and of great scenic beauty and interest.
Papago Saguaro..	Arizona.....	Jan. 31, 1914	2,050	Splendid collection of characteristic desert flora and numerous pictographs. Interesting rock formations.
Dinosaur.....	Utah.....	Oct. 4, 1915	80	Deposits of fossil remains of prehistoric animal life of great scientific interest.
Capulin Mountain	New Mexico...	Aug. 9, 1916	681	Cindercone of geologically recent formation.
Verendrye.....	North Dakota.	June 29, 1917	253	Includes Crowhigh Butte, from which Explorer Verendrye first beheld territory beyond the Missouri River.
Casa Grande....	Arizona.....	{Mar. 2, 1889* Dec. 10, 1909 Aug. 3, 1918}	480	These ruins are one of the most noteworthy relics of a prehistoric age and people within the limits of the United States. Discovered in ruinous condition in 1894.
Katmai.....	Alaska.....	Sept. 24, 1918	1,088,000	Wonderland of great scientific interest in the study of volcanism. Phenomena exist upon a scale of great magnitude. Includes Valley of Ten Thousand Smokes.
Scotts Bluff....	Nebraska....	Dec. 12, 1919	2,053.83	Region of historic and scientific interest. Many famous old trails, traversed by the early pioneers in the winning of the West, passed over and through this monument.
Yucca House*....	Colorado.....	Dec. 19, 1919	9.6	Located on eastern slope of Sleeping Ute Mountain. Is pile of masonry of great archaeological value, relic of prehistoric inhabitants.

¹ Estimated.² Donated to the United States.³ From Mar. 2, 1889, until Aug. 3, 1918, classified as a national park.

National monuments administered by the Department of Agriculture.

[Number, 10; total area, 509.5 square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Area (acres).	Description.
Gila Cliff Dwellings.	New Mexico....	Nov. 16, 1907	180	Numerous cliff-dweller ruins of much interest and in good preservation.
Tonto.....	Arizona.....	Dec. 19, 1907	1 640	Do.
Jewel Cave.....	South Dakota.	Feb. 7, 1908	1 1,280	Limestone cavern of much beauty and considerable extent, limits of which are as yet unknown.
Wheeler.....	Colorado.....	Dec. 7, 1908	300	Of much interest from geological standpoint as example of eccentric erosion and extinct volcanic action. Of much scenic beauty.
Mount Olympus..	Washington...	{Mar. 2, 1909 Apr. 17, 1912 May 11, 1915	299,370	{Contains many objects of great and unusual scientific interest, including many glaciers. Is summer range and breeding ground of the Olympic elk.
Oregon Caves....	Oregon.....	July 12, 1909	480	Extensive caves in limestone formation of much beauty; magnitude not entirely ascertained.
Devil Postpile...	California.....	July 6, 1911	800	Spectacular mass of hexagonal basaltic columns, like an immense pile of posts. Said to rank with famous Giant's Causeway in Ireland.
Walnut Canyon..	Arizona.....	Nov. 30, 1915	960	Contains cliff dwellings of much scientific and popular interest.
Bandelier.....	New Mexico...	Feb. 11, 1916	22,075	Vast numbers of cliff-dweller ruins, with artificial caves, stone sculpture, and other relics of prehistoric life.
Old Kasaan.....	Alaska.....	Oct. 25, 1916	38.3	Abandoned Indian village in which there are numerous remarkable totem poles and other objects of historical interest.

1 Estimated.

National monuments administered by the War Department.

[Number, 2; total area, 6 acres; chronologically in order of creation.]

Name.	Location.	Date of creation.	Area (acres).	Description.
Big Hole Battle Field.	Montana.....	June 23, 1910	5	Site of battle field on which battle was fought Aug. 9, 1877, between a small force of United States troops and a much larger force of Nez Perce Indians, resulting in rout for the Indians.
Cabrillo.....	California.....	Oct. 14, 1913	1	Of historic interest because of discovery of the territory now partly embraced in the State of California by Juan Rodriguez Cabrillo, who at this point first sighted land on Sept. 28, 1542.

APPENDIX C.

Service of Secretaries of the Interior.

Name.	When appointed.	Whence appointed.	President.	Length of service.
				<i>Yrs. mos. days.</i>
1. Thomas Ewing.....	Mar. 8, 1849	Ohio.....	Taylor and Fillmore....	1 5 8
2. Thomas M. T. McKennan..	Aug. 15, 1850	Pennsylvania.....	Fillmore.....	1 5 27
3. Alexander H. H. Stuart....	Sept. 12, 1850	Virginia.....	do.....	2 5 25
4. Robert McClelland.....	Mar. 7, 1853	Michigan.....	Pierce.....	4 0 0
5. Jacob Thompson.....	Mar. 6, 1857	Mississippi.....	Buchanan.....	4 0 0
6. Caleb B. Smith.....	Mar. 5, 1861	Indiana.....	Lincoln.....	1 10 4
7. John P. Usher.....	Jan. 8, 1863	do.....	Lincoln and Johnson....	2 4 7
8. James Harlan.....	May 15, 1865	Iowa.....	Johnson.....	1 2 12
9. Orville H. Browning.....	July 27, 1866	Illinois.....	do.....	2 7 10
10. Jacob D. Cox.....	Mar. 5, 1869	Ohio.....	Grant.....	1 7 27
11. Columbus Delano.....	Nov. 1, 1870	do.....	do.....	4 11 19
12. Zachariah Chandler.....	Oct. 19, 1875	Michigan.....	do.....	1 4 25
13. Carl Schurz.....	Mar. 12, 1877	Missouri.....	Hayes.....	3 11 24
14. Samuel J. Kirkwood.....	Mar. 5, 1881	Iowa.....	Garfield and Arthur....	1 1 2
15. Henry M. Teller.....	Apr. 6, 1882	Colorado.....	Arthur.....	2 11 0
16. Lucius Q. C. Lamar.....	Mar. 6, 1885	Mississippi.....	Cleveland.....	2 10 10
17. William F. Vilas.....	Jan. 16, 1888	Wisconsin.....	do.....	1 1 22
18. John W. Noble.....	Mar. 6, 1889	Missouri.....	Harrison.....	4 0 50
19. Hoke Smith.....	Mar. 6, 1893	Georgia.....	Cleveland.....	3 5 25
20. David R. Francis.....	Sept. 1, 1896	Missouri.....	do.....	1 6 5
21. Cornelius M. Bliss.....	Mar. 5, 1897	New York.....	McKinley.....	1 11 15
22. Ethan Allen Hitchcock.....	Dec. 21, 1898 ¹	Missouri.....	McKinley and Roosevelt	8 0 13
23. James R. Garfield.....	Mar. 5, 1907	Ohio.....	Roosevelt.....	2 0 0
24. Richard A. Ballinger.....	Mar. 6, 1909	Washington.....	Taft.....	2 0 5
25. Walter L. Fisher.....	Mar. 13, 1911	Illinois.....	do.....	1 11 26
26. Franklin K. Lane.....	Mar. 6, 1913	California.....	Wilson.....	6 11 26
27. John Barton Payne.....	Feb. 28, 1920 ²	Illinois.....	do.....	

¹ Entered on duty Feb. 20, 1899.

² The last day of Mr. Lane's service was Feb. 29, 1920.

³ Entered on duty Mar. 15, 1920.

APPENDIX D.

REPORT OF ALASKA ADVISORY COMMITTEE, APPOINTED BY HON. JOHN BARTON PAYNE, SECRETARY OF THE INTERIOR, APRIL 22, 1920, SUBMITTED JUNE 11, 1920.

INTRODUCTION.

The Alaska Advisory Committee, made up of representatives of the Interior, Post Office, and Agricultural Departments, and the Shipping Board, was appointed by and at the request of Hon. John Barton Payne, Secretary of the Interior, its purpose being to advise the Secretary of the Interior as to what immediate steps can be taken to better conditions in Alaska, what industries can be developed, and resources exploited to give employment to a resident population which, in turn, will give a home market for Alaska products.

The committee has examined a large mass of data bearing upon Alaska in the files of the various Government departments, including the records and hearings of several previous Alaska investigations. Informal conferences were also held in Seattle with many persons interested in the development of Alaska, including mining, canning, timber, transportation, and commercial interests, as well as representatives of the Alaskan Engineering Commission and of other Government departments. About a month was devoted to the inquiry, and the report and recommendations of the committee follow, the arrangement being (1) a summary of most important recommendations, (2) brief statements of the industrial conditions in Alaska, and (3) detailed recommendations arranged by topics.

PRINCIPAL RECOMMENDATIONS.

The canvass of the Alaska situation leads the committee to make many recommendations for the improvement of industrial conditions within the Territory, and these are fully set forth in later sections of this report. The most important and urgent of these recommendations are briefly stated as follows:

1. Lowering of ocean freight and passenger rates and improvement of transportation and mail service through economies introduced by combination of two existing steamship lines into one.

2. Concentration and coordination of Federal control of Alaska lands and resources by obtaining legislative authority for an Alaska Development Board, and, pending this, by the appointment of an interdepartmental Alaska committee.

3. Coordination of Federal road construction and the development of a plan for a comprehensive system of roads and trails to serve the entire Territory. Also the requesting of an appropriation of at least \$1,000,000 for the inauguration of this system.

4. Investigation of the commercial feasibility of smelting Alaska copper ores within the Territory.

5. The immediate development of an Alaska pulp-wood industry, and additional surveys of timber and water power looking to the largest possible development of this industry.

INDUSTRIAL CONDITIONS AND RESOURCES.

POPULATION.

The white population of Alaska, 39,000 in 1910, increased by 1915 to about 50,000. From 1915 to 1918, owing to war conditions, the population declined, but in 1919 the tide set northward again and there was a slight increase, which will probably continue in 1920. The present white population of the Territory is estimated to be 36,000, in addition to about 25,000 natives, some of whom are civilized. The industrial population of the Territory exceeds 40,000. The loss in population during the period of the war was due to (1) men entering the military service, estimated to number 3,000, (2) high wages in the States, (3) the decrease in number of men employed in mining. In 1915 about 9,600 men were employed in the Alaska mining industry as compared with about 4,500 in 1919.

The committee believes that under present industrial conditions it is undesirable to make special effort to attract men without capital to Alaska. It would be a mistake to draw to Alaska a greater number of men than can be absorbed by the existing industrial development. What Alaska needs is the development of industries to give employment to labor and thus to attract a population that, in turn, will give a market for local products.

INDUSTRIES AND COMMERCE.

Alaska's basal industries are and always will be mining and fishing, but the Territory includes large resources in pulp wood, some timber suitable for export, extensive reindeer pastures, and lesser areas suitable for stock raising. There are large areas of arable lands in the Territory, but these will be used principally to supply the local population attracted by other industries.

The total value of Alaska's mineral, fish, and fur products, etc. (1867-1919), is \$949,000,000. Alaska's most prosperous year was 1916, when the value of her total products was \$89,350,000. The value of all Alaska products in 1919 was about \$71,000,000.

Value of merchandise imported into Alaska.

Year.	From United States.	From foreign countries.	Year.	From United States.	From foreign countries.
1914.....	\$21,610,000	\$663,000	1917.....	\$39,836,000	\$1,196,000
1915.....	23,293,000	501,000	1918.....	40,412,000	1,175,000
1916.....	30,835,000	1,544,000	1919.....	37,476,000	1,449,000

In 1919, 25 American vessels (net tonnage 32,444) and 5 Canadian vessels (net tonnage 4,870) were operated as common carriers to Alaska ports. These carried 295,490 tons of freight and 32,803 passengers northbound and 278,199 tons of freight and 31,717 passengers southbound. A total of 370 private vessels (over 20 tons) were operated in the Alaska service during 1919, having an aggregate net tonnage of 118,169. Mr. Robert Semmes estimates that these private vessels carried a total of 465,000 tons of freight (north and south bound).

Nine river steamers were operated on the Alaska Yukon and its tributaries in the summer of 1919. These carried a total of 9,691 tons of freight, of which 1,906 tons was for the Alaskan Engineering Commission. Besides the local passengers, of which no record is available, a total of 1,369 in and out bound passengers were carried by the steamers. One steamer was operated on the Kuskokwim River during the summer of 1919 and carried a total of about 800 tons of freight.

MINING.

Alaska mines have produced minerals to the total value of \$438,000,000, of which \$311,000,000 is the value of the gold output. In 1914, \$19,066,000 worth of minerals were produced; in 1919, \$19,700,000. During the war there was an abnormally large output of copper, which in 1916 brought the value of the total mineral output up to \$48,637,000.

Alaska gold mining, like that of the rest of the world, has been curtailed because of economic conditions imposed by the war. As a consequence the value of the Alaska gold output has steadily declined from \$17,242,000 in 1916 to about \$9,550,000 in 1919. Gold mining has long been the principal Alaska industry, for though it has employed far less men than the fisheries, yet the prospectors and miners, unlike the fishermen, were all permanent residents of the Territory. In the past over 60 per cent of the population has been directly or indirectly employed by the gold-mining industry. Therefore the decline in gold mining has been the principal cause of Alaska's loss of population and the discouragement of her residents. In 1916, 4,000 men were engaged in placer mining; in 1919, only 2,000. A revival of gold mining would undoubtedly greatly increase the prosperity of the Territory.

The total placer gold produced in Alaska has a value of \$218,000,000. Much of this has been won from the rich bonanza deposits whose exploitation requires little capital. It is not impossible that other rich placers will be found, but the only certain reserves of placer gold are in the extensive deposits of auriferous gravels containing comparatively small gold values. These must be exploited by mechanical methods involving large investments. Including in the reserves only the auriferous gravels of which some test has been made and which are believed to carry enough gold to warrant exploitation under prewar economic conditions, the Geological Survey estimates that the Alaska placer gold reserves have a value of between \$240,000,000 and \$360,000,000.

Alaska gold-lode mining in the past has been chiefly based on large low-grade deposits of the Juneau district, whose profitable exploitation has been possible only by very large operations. The enormously increased cost of mining, owing to the present economic conditions, has greatly curtailed mining at Juneau.

The most promising present field for Alaska gold lode mining is in the exploitation on a small scale of the auriferous lodes of higher gold tenor, which have been found in many localities, notably in the Willow Creek and Fairbanks districts. Geologic information indicates a wide distribution of auriferous deposits, and there is every reason to believe that other workable deposits of gold-bearing quartz

will be developed when the country is opened up by railroads and wagon roads.

Alaska copper mines, first operated in 1901, have produced a total of 545,000,000 pounds of copper, valued at \$114,526,000. Stimulated by the war prices of copper, the Alaska mines made their maximum output in 1916, amounting to 119,855,000 pounds, valued at \$29,484,000. Owing to the fall in price of metal and to uncertainty of market the Alaska copper production fell in 1919 to 47,220,000 pounds, valued at \$8,783,000.

Copper deposits are widely distributed in Alaska, and there is every reason to believe that their exploitation will increase under better transportation conditions. Much the larger part of the present copper output has come from the high-grade ores of the Chitina district. Larger bodies of low-grade ore have been found in several districts, notably on Prince William Sound, and the exploitation of these should give a greater stability to the Alaska copper-mining industry.

Owing to the withdrawal of all Alaska coal lands from entry in 1906 there was no development of the coal fields until the leasing law went into effect in 1914. Since then some advances have been made, but operations have been hampered by economic conditions imposed by the war, and by certain restrictions in the leasing law. As a consequence Alaska has produced in all only 253,000 tons of coal, and her output in 1919 was only 60,000 tons. Meanwhile she is importing annually about 100,000 tons of coal from Washington and British Columbia.

Much the larger part of the coal reserves of Alaska are lignitic, which, under present methods of utilization, are not available for export. The Bering River and Matanuska fields contain, however, very high-grade bituminous coals of a better grade than any found on the Pacific seaboard, as well as some anthracite. These coals are for the most part closely folded and much broken, making them expensive to mine and rendering them in part unavailable for present profitable exploitation. There are, however, in both fields high-grade coals that can be mined, and these will find an export market. Until these fields have been more thoroughly prospected by underground exploration it is impossible to predict how large an annual tonnage can be produced from them.

The Alaska oil lands were withdrawn from entry in 1910 and thereby practically all petroleum development was stopped until the passage of the leasing law in 1920. In spite of this handicap some 53,000 barrels of petroleum have been produced in the Katalla field. Meanwhile, Alaska is drawing on California annually for nearly 500,000 barrels of petroleum and petroleum products. This does not include the oil consumed by steamers running to Alaska ports. The information afforded by seepages indicates that there are five oil fields in Alaska which could probably be made productive. So far as known the Alaska petroleum is a high-grade refining oil for which there is at present a great need. Therefore the development of the Alaska petroleum fields is not only of great importance to the Territory but also to the entire Nation.

Incidental to gold and copper mining considerable silver and some lead have been produced from Alaska ores. Galena ores, some of

which carry a high percentage of silver, are widely distributed in Alaska and are now receiving considerable attention. Both placer and lode tin have been found in the York district of Seward Peninsula. Placer tin has also been found in some of the Yukon camps. So far as known there are no large reserves of placer tin in Alaska. The outlook for lode tin mining in the York district is rather hopeful.

Platinum and related metals are being mined in Alaska. During the war Alaska produced antimony, chromite, and tungsten. The known reserves of these metals are considerable. Quicksilver mining has been carried on in a small way for many years in the Kuskokwim region and will no doubt continue. Molybdenite and bismuth ores are rather widely distributed in Alaska, and nickel ores have been found in the Territory.

There are large deposits of marble in southeastern Alaska, and marble quarrying is increasing. Gypsum has long been mined in the Sitka district. Sulphur deposits occur in the Aleutian Islands and are now being developed. There is considerable graphite in Seward Peninsula, and some of this mineral has been produced.

FISHERIES.

The total value of the Alaska fishery products up to the close of 1919 is \$418,042,000. Measured from the standpoint of value of annual product and men employed the fishing industry is the most important of the Territory. It was especially prosperous during the war, the value of its total output increasing from \$15,739,068 in 1913 to \$59,144,859 in 1918. The number of employees rose from 24,263 in 1913 to 31,213 in 1918. Much the larger part of this output is canned salmon, the value of the cannery output in 1913 being \$13,531,604 and \$51,041,949 in 1918. Of the total employees in the fishing industry 16,513 were employed in the salmon canneries in 1913 and 26,502 in 1918. The canneries are operated for only a few months in the year, and much the larger part of the labor is imported. The total investment in the Alaska salmon-canning industry increased from \$31,341,670 in 1913 (79 canneries) to \$63,901,397 in 1918 (135 canneries).

Though the size and value of the Alaska salmon catch overshadows all the rest of the fishing industry, yet notable increases were made during the years 1913 to 1918 in the halibut, cod, herring, and other Alaska fisheries.

The Alaska salmon catch has probably reached its maximum, and any effort to a more intensive development of these fisheries would lead to their rapid depletion. Given proper safeguards against overfishing, the salmon-fishing industry of Alaska can be made to yield a large and continuous annual return.

Without drastic protection the halibut fisheries of Alaska and of the adjacent seas will soon be depleted. As many of the halibut banks lie without the 3-league limit, their protection is only possible by international agreement. The herring and cod fisheries of Alaska are enormous, and the present annual yield is but a fraction of the fish that could be produced. There are many other varieties of fish in Alaska waters which will eventually be developed as part of the commercial fisheries.

FARMING AND STOCK RAISING.

Alaska contains extensive areas of farm lands suitable for raising the hardier grains, including wheat, potatoes, forage crops, and many varieties of vegetables. Tests have shown that sugar beets can be matured in the Tanana and Susitna Valleys, and that these contain a high percentage of sugar. The most promising agricultural fields are in the Tanana and in the Susitna Valleys, both tributary to the Government railroad. Extensive areas of agricultural land are also found in other parts of the Yukon Basin, and in lesser amounts in some of the Pacific coastal region.

The best developed farming region is that tributary to Fairbanks. In this region there are 102 homesteads, with about 2,000 acres of land under cultivation and with an agricultural population of about 250. These farms produced in 1919 60 tons of wheat, 40 tons of oats, 10 tons of barley, 500 tons of hay, 325 tons of potatoes, 60 tons of vegetables, and 150 hogs. The success during the last five years in the raising of wheat has so encouraged the farmers and local business men that they are now building a small flour mill at Fairbanks. There is a little dairying at Fairbanks and in other parts of the Territory, but the raising of cattle has not yet been greatly developed in connection with other farming.

There are good grazing lands in the interior, but the period of winter feeding is about eight months. In the coastal region of southwestern Alaska the season of pasture is much longer. Cattle were introduced on Kodiak and other islands by the Russians and have been raised ever since. It is probable that there are cattle ranges in southwestern Alaska where beef and mutton could be raised for export.

TIMBER RESOURCES.

The best timber in Alaska, chiefly composed of Sitka spruce and hemlock, is in the Tongass National Forest, in southeastern Alaska, and in the Chugach National Forest, in the Prince William Sound region. These two forests embrace 20,000,000 acres, approximately 5 per cent of the total area of Alaska. Between these two forests lie about 2,000,000 acres of timber of similar character. In the interior there is approximately between 50,000,000 and 75,000,000 acres of spruce, birch, and cottonwood. This is chiefly valuable for local use.

The national forests are estimated by the Forest Service to include 77,000,000,000 feet (b. m.) of timber suitable for lumber and pulp. The annual production of timber is relatively small, but the proportion of timber cut from the national forests, as compared with lumber imported, is steadily increasing. In 1906 the lumber shipped into Alaska composed 86 per cent, as compared with 14 per cent cut from national forests. In 1919 the proportion was exactly reversed, 86 per cent being produced locally and 14 per cent imported, chiefly Douglas fir for heavy construction purposes. Alaska Sitka spruce is now being exported as far as the Atlantic coast for specialized use, and the birch will also in all probability find an export market.

REINDEER.

Between 1892 and 1902 the Government imported 1,280 reindeer into Alaska for the use of the Alaska natives. The natural increase

from the original stock has resulted in a herd numbering nearly 200,000, besides which about 100,000 have been killed for food and skins. Of these about 69 per cent belongs to the natives, 5 per cent to the missions, 23 per cent to Laplanders and other whites, and 3 per cent are still in Government ownership.

There is a company at Nome which engages in raising reindeer for the market. Their herd now includes nearly 20,000 animals, and they have three cold-storage plants in operation and two more in construction. Shipments of reindeer meat are limited to cold-storage capacity of steamers running to Nome, and were 99,000 pounds in 1918 and 37,000 pounds in 1919.

There are extensive reindeer pastures in inland Alaska and on the shores of Bering Sea and the Arctic Ocean. It is estimated that these pastures should support a total of 9,000,000 to 10,000,000 animals. The reindeer range, tributary to Broad Pass and hence to the Alaska Railroad, should be capable of supporting some 600,000 animals. This, if utilized, will give tonnage to the railroad and would furnish a new source of meat and leather from a region which has no value for other purposes.

FURS.

Since 1867 Alaska has produced furs to the value of about \$90,400,000, of which about \$53,000,000 represents the value of the seal-skins. The value of the Alaska furs has increased from \$761,729 in 1913 to \$2,288,170 in 1918. Of these amounts \$66,095 in 1913 and \$924,570 in 1918 represent the value of the fur seals killed by the Government on Pribilof Islands.

The raising of foxes and other fur-bearing animals is on the increase in Alaska, and promises to become a more important industry. The evidence in hand indicates that Alaska will continue to yield a valuable annual fur product. The fur seals promise to be a large source of annual revenue to the Government.

FINDINGS AND RECOMMENDATIONS.

WATER TRANSPORTATION.

Alaska is served by three ocean transportation systems: The Alaska Steamship Co. and Pacific Steamship Co., being American lines; and the Canadian Pacific, being a Canadian company. The Alaska Steamship Co. serves all main sections of the Territory, the Pacific Steamship Co. all sections excepting the Bering Sea or Nome route, and the Canadian Pacific Co. only southeastern Alaska or inside passage ports.

The freight and passenger rates of the American companies show a general increase since 1914. Whether these rate increases have been justified was not inquired into by the committee, as such inquiry, necessitating an expert examination of the company's operating costs and property valuations, could not be undertaken in the brief time allowed for the committee's investigations. The committee therefore attempted only to ascertain whether the Territory could develop under existing rates.

It was the opinion of practically every person appearing before the committee that money could not be attracted to Alaska, industries dependent upon transportation by regular lines started, or general development go forward freely under existing rates, and this was the conclusion reached by the committee. Having reached this conclusion, the committee sought to determine the elements in the transportation situation, controlling efficiency and cost of service, to ascertain whether an equal or better service might be secured at a lower cost, and if so, whether freight rates might not be reduced accordingly.

The following were the outstanding transportation elements thus developed:

1. No material benefits now accrue from maintaining two American lines. There is no competition.

2. The Alaska freight and passenger traffic load has two high peaks, spring and fall, requiring an excess equipment in order to insure sufficient elasticity to meet them.

3. The total freight carried yearly by the American lines is approximately half the total cargo space, revealing the extent of the economic loss occasioned by the traffic peaks.

4. The service is at times very irregular, due to the nature of the traffic handled and lack of coordination of sailings between the two companies.

5. Regular and the best possible service to all districts of Alaska can not be given by existing companies under their present methods and burdens of operation.

6. The Post Office Department is not functioning, and can not function to meet the needs of Alaska under the existing organization of transportation facilities.

7. The combined control of land and water transportation facilities precludes the most efficient supervision and regulation of either, and the further alliance with mining and smelting interests produces a psychological situation injurious to Alaskan development and consequently to traffic expansion.

8. Canadian competition to southeastern Alaska is a serious factor in the development of an adequate American service. Southeastern Alaska traffic should help support the entire Alaska transportation system. The portion of that traffic going to the Canadian line cripples to that extent a comprehensive transportation scheme for the entire Territory.

The committee is unanimous in the conclusion that the two independent steamship lines, as at present organized, can not solve the transportation problem of Alaska. It therefore recommends:

1. That an effort be made to consolidate, under proper safeguards, existing American lines into, or substitute therefor, one purely ocean transportation company, as the quickest and surest method to reduce existing ocean freight rates and to meet other transportation necessities.

2. That the Shipping Board be requested to at once begin an inquiry into all elements entering into the reasonableness of present ocean freight rates, to the end that the committee's first recommendation failing, some measure of relief may, if possible, be secured by an equitable reduction in rates.

3. That in case it should develop that the shipping bill recently passed does not adequately protect American coastwise lines from Canadian competitors, such protection be secured by further legislation.

4. That the Post Office Department be requested to assist in every manner permitted by existing law or by additional legislation in providing an adequate transportation service for Alaska, which shall permit of the reasonable development of that Territory.

5. That, if one line be substituted for the two existing American lines, the vessel routes and sailings be entirely rearranged by and with the cooperation of the Shipping Board and Post Office Department, to the end that all sections of Alaska may receive reasonable transportation and mail service.

6. That in case a substitution of one line for the two existing American lines be accomplished, the Shipping Board allocate vessels for limited periods to the residual line to enable it to meet the peak traffic loads and to preclude the maintenance throughout the year of an excess tonnage.

7. That in case the substitution of one line be made, as above outlined, strict supervision of all rates and rate increases shall at all times be maintained by the United States Shipping Board, that all benefits from such consolidation shall at all times be secured to the people of Alaska through reduced freight rates and the maintenance of reasonable service.

8. That, pending the establishment of an improved service, the cannery and other private fishing vessels operating to ports off the main routes of travel be authorized and encouraged to carry passengers and freight for the public to such ports not regularly served by common carrier; also that upon the establishment of a common carrier service to any port the authority of the cannery vessels to carry passengers or freight other than their own to such ports shall be terminated.

9. That any action looking to a readjustment of the interior waterways service (Yukon River, etc.) be postponed until the completion of the Government railroad to Nenana, when a revision of such services will be imperative. Transportation charges on the Yukon and Tanana Rivers are high and the service on the lower Yukon inadequate, but no temporary measures of relief present themselves.

CONCENTRATION AND COORDINATION OF FEDERAL CONTROL.

Nearly all of Alaska's resources are directly or indirectly controlled by the Federal Government. About 99 per cent of the land is still in Government ownership. The development of coal and oil deposits is under Government leases. Water powers and fisheries are under Federal control, and nearly all Alaska timber is in Government ownership.

The Federal control of Alaska's resources is vested in a number of bureaus and departments. Rules and regulations relating to Alaska affairs, under the existing statutes, must be made by Washington authorities, who are also in large measure directly charged with their execution. This long-distance administration has been a serious handicap to the development of Alaska. In many instances regulations have been made which did not meet the local requirements, and

unjust decisions rendered because those making them were not familiar with local conditions. This situation has worked a particular hardship on the operator with small capital, who could not afford to make the long journey to present his argument in person to the Washington authorities.

Owing to the divided authority and the limitations placed by statutes and appropriations, there has also been a lack of coordination between various Alaska Federal activities. For example, there are four different Federal bureaus who have funds for construction of wagon roads in Alaska, in addition to the grants made by the Territorial government. So far as possible this situation has been met by cooperation between the several agencies involved. Again, the duty of enforcement of game laws is shared by the governor of Alaska and the Departments of Commerce and Agriculture. To improve these conditions the committee recommends that—

1. The passage of an act providing for an Alaska Development Board, located in Alaska, and authorized to administer the Federal laws relating to public lands, leases, water powers, fisheries, timber, railroad construction and operation, and wagon-road construction.

2. That the Alaska Development Board should not take over the purely investigative work in Alaska forming a part of the activities of the large Federal scientific organizations. This, because such investigations as, for example, those of the Geological Survey, Coast Survey, Weather Bureau, and of other scientific bureaus, can best and most economically be carried on by the existing agencies.

Mr. Sherman, representing the Department of Agriculture, refrained from joining in the above two recommendations. On May 24 the Secretary of Agriculture addressed a letter to the Departments of War, Interior, Labor, and Commerce, suggesting that any comprehensive legislation for the reorganization of the administration of national property and interests in Alaska should be based upon a joint consideration of the departments concerned. Since the matter is therefore under interdepartmental consideration, at the request of the Department of Agriculture, Mr. Sherman did not feel authorized or qualified to give advice in the premises.

Pending the congressional authorization for an Alaska Development Board and as a temporary expedient, the committee further recommends—

1. That an interdepartmental Alaska committee be organized, to be composed of representatives of all Government departments concerned in Alaska affairs. Also, that the governor of Alaska be made an ex officio member of this committee.

2. That an additional Assistant Secretary of the Interior Department be appointed, who shall be chairman of the committee and shall devote all his time to Alaska affairs.

3. That the chairman of the committee shall spend a large part of his time in Alaska, and thus by personal contact become intimately acquainted with Alaska conditions.

WAGON ROADS AND TRAILS.

The committee finds that the construction of wagon roads and trails is one of the most important and urgent needs of Alaska. Without the construction of a large mileage of wagon roads and

trails the resources of the Territory can not be made available. Nothing will contribute more to development of tonnage for the Government railroad than a system of tributary wagon roads. The committee recommends that—

1. A general system of main highways be planned, to be constructed and maintained by the Federal Government.

2. The construction and maintenance of local roads and trails be left to the Territory.

3. The systems outlined in the above two recommendations include the construction of properly located trails, to be subsequently improved into wagon roads, into every new district where promising discoveries of minerals have been made.

4. A plan for coordination, so far as it has not already been done, of the various Federal road-building agencies be prepared by the proposed interdepartmental Alaska committee, with the advice of Federal officials resident in the Territory, as well as of the Territorial officials. That this matter be relegated to the Alaska development board as soon as it is organized.

5. In acting upon the foregoing recommendations the following road-building projects be given consideration:

(a) A wagon road from Alaska Railroad to the Kantishna mining district, to be connected with Mount McKinley National Park, and extended to McGrath and to the Iditarod district.

(b) A wagon road from Alaska Railroad to the Valdez Creek placer district, to be subsequently connected with the Valdez-Fairbanks road.

(c) Trails, and eventually wagon roads, connecting the Alaska Railroad with the copper deposits of the Talkeetna and other near-by districts.

(d) A wagon road from the Alaska Railroad to the Yentna (Cache Creek) district, to be later extended into the Kuskokwim Valley.

(e) A wagon road from the Copper River Railroad into Nizina placer district, and its eventual extension into upper Chitina Valley.

(f) A wagon road from the Valdez-Fairbanks road to the Chistochina (Slate Creek) district, to be later extended to Chisana district and eventually to the White River, and also a branch road connecting with the Fortymile Road at the Tanana River.

(g) A wagon road from Fairbanks into Tolovana (Livengood) district, later to be extended to the Yukon and connecting with the Koyukuk road.

(h) A wagon road from Fairbanks or Livengood to mouth of Tanana River, to be extended along north side of Yukon River to Ruby.

(i) A wagon road from Fairbanks to Circle district.

(j) A wagon road from Yukon River into Koyukuk and Chandalar districts.

(k) The extension of Eagle-O'Brien Creek road into Fortymile district, later to be built through to the Tanana River.

(l) The extension of Hot Springs wagon road to Rampart district.

(m) The extension of Ruby-Long Creek wagon road to McGrath.

(n) A wagon road from the north bank of Yukon at Ruby to Nome.

(o) A wagon road from Nome to Candle and Kiwalik.

(p) A wagon road from Iliamna Bay (Cook Inlet) to Iliamna Lake, to be eventually extended to Lake Clark.

6. Congress be asked to make an annual appropriation of not less than a million dollars for the construction and maintenance of wagon roads and trails in Alaska.

MINING INDUSTRY.

The committee finds that there are large undeveloped mineral resources in Alaska; that the advance of the mining industry is dependent chiefly on (1) cheaper transportation and (2) construction of wagon roads and trails, but that there is also need of investigations and reports on certain of its features. The committee recommends that—

1. The Bureau of Mines make a report on the feasibility of smelting Alaska copper ores within the Territory. This work to be done in cooperation with the Geological Survey so far as may be necessary.

2. The Bureau of Mines make an investigation and report on methods and costs of placer mining in Alaska. This to be specially directed toward the development of methods of exploiting the large bodies of auriferous gravels of low gold content.

The committee finds that the development of coal and oil fields is of first importance to the Territory. It therefore recommends that—

1. Every encouragement be given to coal and oil development, especially by making the terms of leases as liberal as the law allows.

2. The necessary underground explorations in the Matanuska coal field be prosecuted with vigor by the Government.

3. The companies engaged in prospecting the Bering River coal field be given every encouragement to develop coal and to the building of railroads necessary to its marketing.

4. The interdepartmental committee give immediate and earnest consideration to the desirability of the establishment of a coaling station for commercial and naval uses at a port in the Aleutian Islands most suitably located to serve trans-Pacific shipping and, if possible, the cannery industry of southwestern Alaska.

The committee furthermore recommends that Congress be asked:

1. To increase the appropriation for the investigation of the mineral resources of Alaska, as being one of the most important steps to further mining development in the Territory and the development of tonnage for the railroad.

2. To modify the Alaska coal-leasing law allowing a prospecting period of four years before a lease is signed.

The committee finds that while the Alaska petroleum leasing law is liberal for developed fields, for those where there are some surface indications of petroleum and for those that are readily accessible, its terms do not encourage the search for oil in inaccessible wild-cat territory. The committee believes, for example, that to induce capital to explore for oil in the Arctic coast region of Alaska, where there are some indications of its presence, a more generous law must be enacted. It recommends that this matter be taken under advisement and that appropriate legislation be asked for.

LUMBER AND WOOD PULP.

Wood pulp and print paper furnish one of the greatest immediate opportunities for the profitable employment of labor and capital in Alaska. The Forest Service estimates an ultimate possible annual production of about 2,000,000 cords of pulpwood from Alaska timber, yielding a newsprint product equal to one-third of our present annual consumption. The Tongass National Forest (southeastern Alaska) affords the best opportunity for immediate development, and the committee is informed that one bid for 100,000,000 feet of pulp timber in this district has been received. To encourage and hasten the development of Alaska timberlands, the committee recommends that—

1. An intensive campaign be made for the development of Alaska pulp wood by laying before the pulp and paper manufacturers and consumers the possibilities of the immediate development of an industry in the Territory.

2. The surveys of the pulp-wood timber and water powers of the coast region be extended.

3. A reconnaissance be made by the Forest Service of timber resources of the interior, especially with a view of determining whether they have value for pulp.

4. The export of birch and Sitka spruce timber be encouraged in every way.

5. The Forest Service investigate the possibilities of reforestation of the burnt-over lands of the interior of Alaska.

WATER POWER.

The committee finds that there are extensive water powers in Alaska; that the exact information about them is exceedingly meager. These water powers are important to the development of the mining, cannery, and pulp-wood industries. The only investigations made of the water power are carried on by small allotments made from the appropriations for the investigations of the mineral resources of Alaska, thereby decreasing the funds available for other important surveys of mineral wealth.

The committee therefore recommends that Congress be asked for an appropriation of \$40,000 to investigate the water resources of Alaska with reference to their use to mining, wood pulp, and other industries.

FISHERIES.

The data collected by the committee relating to the fisheries clearly indicate that there is urgent need of legislation to protect the salmon industry of Alaska so as to prevent the depletion of the fisheries; also that the halibut fisheries of Alaska and adjacent international waters are seriously threatened with exhaustion unless steps be taken looking to their conservation.

The committee therefore indorses the general plans of the Department of Commerce looking to the conservation of the salmon and halibut fisheries.

The facts in hand indicate the necessity of an extension of the investigations of the commercial fisheries of Alaska, notably along

Alaska Peninsula, Aleutian Islands, and in Bering Sea. The committee recommends that these investigations be vigorously advanced by the Bureau of Fisheries and that additional appropriations be asked for if needed to carry out this plan.

AGRICULTURE AND GRAZING.

The committee finds that there are in Alaska (a) large areas of farming land, (b) some stock ranges, and (c) extensive reindeer pastures; also that the most promising present field for homesteaders is the region tributary to the Alaska Railroad. The committee recommends that—

1. The Department of Agriculture appoint a subagent, qualified by Alaska experience, to be in charge of agricultural investigations in the Susitna, Tanana, and Yukon Valleys, who is to have general supervision of the Matanuska and Fairbanks stations and to be provided with the necessary assistants and facilities, so that he may carry on personal investigations (1) of the needs of the homesteaders and (2) of the undeveloped agricultural resources of inland Alaska; also that he work in close cooperation with the land and industrial department of the Alaskan Engineering Commission.

2. The Agricultural Department make an investigation and report on the commercial possibilities of developing a sugar-beet industry in Alaska and, if this be practical, present a plan for bringing this about.

3. The Agricultural Department make an investigation of the commercial possibilities of stock raising on the Alaska Peninsula and on Kodiak and other islands of southwestern Alaska and, if this be practical, recommend means by which such an industry can be developed.

4. All Alaska ocean, river, and land transportation lines be requested to grant special passenger rates to farm settlers and special freight rates on household goods, farm implements, breeding stock, and fertilizer for use of farm settlers.

5. The subdivisional surveys be extended by the General Land Office over Alaska farming lands likely soon to be homesteaded; the Department of Agriculture be requested to designate the lands which should be covered by such surveys; and, pending the extension of the regular surveys, the General Land Office make the surveys of individual homesteads as rapidly as possible.

6. Mr. W. T. Lopp, of Bureau of Education, make a report on the possibilities of Alaska reindeer industry, together with a detailed plan for its development.

7. Steps be taken to transfer Government or native reindeer herds to Broad Pass region, and thus make them tributary to the railroad.

8. The reorganization of the ocean transportation to provide material increase of cold-storage capacity on vessels running to Alaska ports to meet the developments of the reindeer industry as well as that of frozen fish.

The committee further recommends that the following legislation be asked for:

1. An extension of the farmer's loan act to Alaska.

2. An extension of the stock-raising homestead act to Alaska, modified to meet the conditions in the Territory.

PUBLICITY.

The committee finds need for intelligent publicity for Alaska, and recommends that—

1. This should take the form of placing before the business interests of the country the possibilities of the industrial development of the Territory. To bring this about studies of the various possible industries, such as have been recommended above, should be made, and statements prepared covering the elements entering into such development.

2. No effort should be made to bring to Alaska permanent residents beyond the capacity of the industrial development to maintain them.

3. A publicity campaign should be directed to the attraction of tourists and pleasure seekers to Alaska.

4. The work of the Territorial publicity bureau, the land and industrial department of the Alaskan Engineering Commission, and the various Federal bureaus engaged in advertising Alaska, and, so far as possible, that of private agencies, such as the Seattle and the several Alaska chambers of commerce, should be coordinated.

NAVIGATION.

The committee finds that only about 9 per cent of Alaska's ocean waterways have been charted, and that there is a great lack of light-houses and other aids to navigation. These conditions are one of the contributing elements to the high operating costs of Alaska steamers. The committee has received a number of specific recommendations for installation of aids to navigation. In most instances, however, the information is not sufficiently complete to justify the indorsement of such projects. The committee, however, feels justified in recommending that—

1. A lighthouse be built at Cape Spencer, near Icy Strait.

2. Aids to navigation be placed at the entrance to the Kuskokwim River.

The committee further recommends that Congress be asked to give increased appropriation for the charting of Alaska coast line and for aids to navigation.

KUSKOKWIM REGION.

Certain needs of the Kuskokwim Valley, whose fishing and mineral resources are now attracting attention, have been laid before the committee. In view of the lack of complete information about this region the committee hesitates to make definite recommendations. The following matters are, however, called to the attention of the interdepartmental committee for its earnest consideration:

1. By the existing statutes the Kuskokwim Basin now lies in three different judicial districts, and it has been pointed out that this makes the enforcement of law both difficult and expensive. It has been recommended to the committee that the Kuskokwim Basin be placed in the second judicial district by a change of boundaries. (See Nelson bill, S. 4205, Apr. 12, 1920.)

2. It has been represented to the committee that there is only one deputy marshal in the entire Kuskokwim Basin. It has been recommended to the committee that a second marshal should be provided for this region.

3. It has been represented to the committee that commercial fishing at the mouth of the Kuskokwim River would deplete the salmon run to the detriment of the natives and whites living on the upper river, and therefore that such fishing should be curtailed or prohibited. An investigation of this matter by the Bureau of Fisheries would appear to be justified.

4. The best route of approach to the lower Kuskokwim Valley from the Yukon River is by the "Portage Trail." This crosses a swampy lowland, about 25 miles wide, connecting the valleys of the two rivers. The lowland is traversed by many streams and dotted by numerous lakes. Travel is by boats along the streams and lakes and by swampy trails connecting the waterways. Mail is carried over this route, and there is considerable other travel. It has been suggested that the route could be improved at no great expense and thus give better access to the lower Kuskokwim Valley.

MAIL SERVICE.

The Post Office Department has furnished the committee with the following statements with reference to the Alaska mail service:

In 1916 there were 51 mail routes in the interior of Alaska, while in 1920 the number increased to 55. The number of steamboat routes from Seattle to Alaska ports was 28 in 1916 and the same in 1920, but the number of dispatches of mail from Seattle to 8 principal ports in Alaska was 40 to 50 per cent less in 1919 than in 1916, showing a great decrease in actual sailings from Seattle to Alaska in 1919 over 1916. Mail is sent from Seattle to Alaska on every available sailing that will expedite its delivery.

Under the reduced opportunities to send the mail to Alaska, the Post Office Department succeeded in 1919 in making 9 dispatches per month during the summer to Ketchikan, Juneau, and Skagway; 6 each to Petersburg, Cordova, Valdez, and Seward; and during the winter of 1919, 7 trips per month each to Ketchikan and Juneau, 6 to Seward, 5 to Cordova and Valdez, 4 to Wrangell and Petersburg, and 1 to Skagway.

The Post Office Department advises that it is necessary to maintain regular sailings with fixed ports of call to give Alaska a mail service commensurate with its commercial needs, and for such service the department has always paid a rate for carrying the mails far in excess of the rates for freight and express matter.

Since July 1, 1918, the department has not been able to induce either of the two steamship companies operating to Alaska to make a bid for carrying the mail to stated ports of call and on a fixed number of sailings. One of the companies refused to bid for the service to cover stated points, and the other company refused to bid on a contract on a fixed number of sailings. Each company prior to July 1, 1918, had made such contracts.

The committee has received many general criticisms of the Alaska mail service and a number of definite recommendations for the modification of existing mail routes.

The committee believes that the improvement of ocean transportation herein recommended will make it possible to so improve the mail service as to meet all the general criticism. The information and time available to the committee are insufficient to justify specific recommendations in regard to mail routes. The committee recommends that—

1. In connection with the revision of the transportation system suggested in this report a rearrangement of the ocean mail routes be provided, to the end that more frequent and more extensive service be given Alaska;

2. The Post Office Department confer with the interdepartmental Alaska committee for recommendations in the selection of the most feasible routes to meet the needs of the inland communities.

Respectfully submitted.

ALFRED H. BROOKS, *Chairman,*
Department of the Interior.

H. Y. SAINT,
Shipping Board.

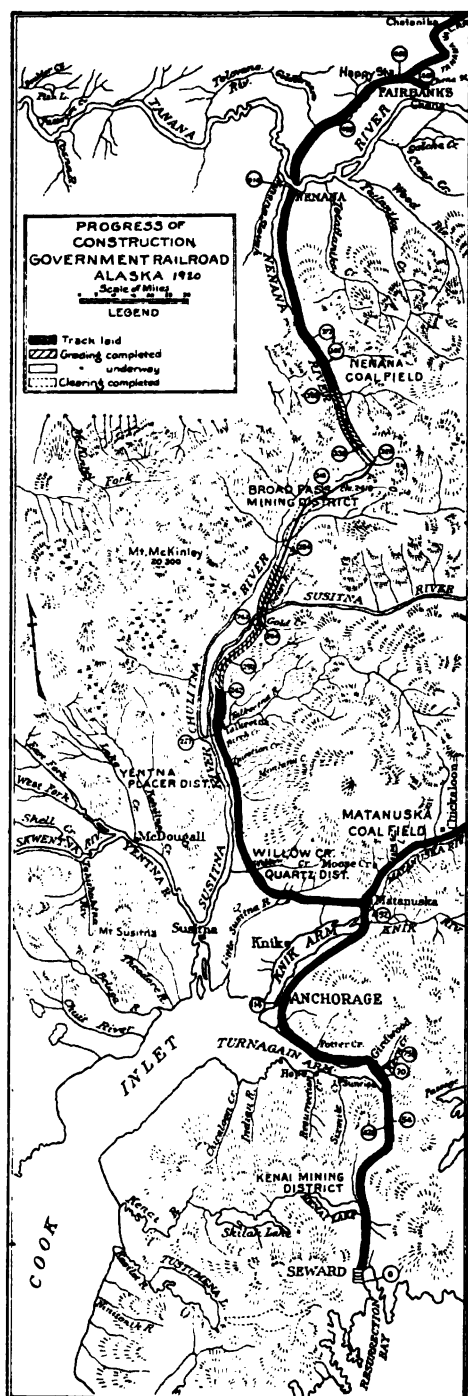
OTTO PRAEGER,
Second Assistant Postmaster General.

E. A. SHERMAN,
Department of Agriculture.

WASHINGTON, D. C., June 11, 1920.

APPENDIX E.

Map showing progress of work on Government railroads in Alaska, 1920.



DEPARTMENT OF THE INTERIOR

REPORT

OF THE

COMMISSIONER OF THE GENERAL
LAND OFFICE

TO THE

SECRETARY OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

COMMISSIONERS OF THE GENERAL LAND OFFICE.

Commissioner.	State.	Date.	Secretary.
Tiffin, Edward	Ohio	May 7, 1812	Gallatin and Campbell. ¹
Meigs, Josiah	Georgia	Oct. 11, 1814	Dallas and Crawford. ¹
McLean, John	Ohio	Sept. 11, 1822	Crawford. ¹
Graham, George	District of Columbia.	June 26, 1823	Crawford to Ingham. ¹
Hayward, Elijah	Ohio	Sept. 30, 1830	Ingham to Woodbury. ¹
Brown, Ethan A.	do	July 24, 1835	Woodbury. ¹
Whitcomb, James	Indiana	Oct. 21, 1836	Woodbury and Ewing. ¹
Huntington, Elsha M.	do	July 3, 1841	Ewing and Forward. ¹
Blake, Thomas H.	do	May 19, 1842	Forward to Walker. ¹
Shields, James	Illinois	Apr. 16, 1845	Walker. ¹
Young, Richard M.	do	Jan. 6, 1847	Walker ¹ to Ewing. ²
Butterfield, Justin	do	July 1, 1849	Ewing and McKennan. ¹
Wilson, John	District of Columbia.	Sept. 16, 1852	Stuart and McClelland. ¹
Hendricks, Thomas A.	Indiana	Aug. 8, 1855	McClelland and Thompson.
Smith, Samuel A.	Tennessee	Oct. 13, 1859	Thompson.
Wilson, Joseph S.	District of Columbia.	Feb. 23, 1860	Do.
Edmunds, James M.	Michigan	Mar. 19, 1861	Smith to Browning.
Wilson, Joseph S.	District of Columbia.	Sept. 1, 1866	Browning to Delano.
Drummond, Willis	Iowa	Feb. 4, 1871	Delano.
Rurdett, Samuel S.	Missouri	July 1, 1874	Delano and Chandler.
Williamson, James A.	Iowa	June 24, 1876	Chandler to Kirkwood.
McFarland, Noah C.	Kansas	June 17, 1881	Kirkwood and Teller.
Sparks, William A. J.	Illinois	Mar. 26, 1885	Lamar.
Stocksager, Strother M.	Indiana	Mar. 27, 1888	Vilas.
Groff, Lewis A.	Nebraska	Sept. 16, 1889	Noble.
Carter, Thomas H.	Montana	Mar. 30, 1891	Do.
Stone, William M.	Iowa	Nov. 18, 1892	Do.
Lamoureux, Silas W.	Wisconsin	Mar. 28, 1893	Smith and Francis.
Hermann, Binger	Oregon	Mar. 25, 1897	Bliss and Hitchcock.
Richards, William A.	Wyoming	Jan. 26, 1903	Hitchcock.
Ballinger, Richard A.	Washington	Jan. 28, 1907	Garfield.
Dennett, Fred	North Dakota	Jan. 14, 1908	Garfield, Ballinger, and Fisher.
Tallman, Clay	Nevada	June 5, 1913	Lane and Payne.

¹ Secretaries of the Treasury.

² Ewing and all following Secretaries of the Interior.

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REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, September 15, 1920.

DEAR SIR: I have the honor to submit the following report of the transactions of the General Land Office during the fiscal year ended June 30, 1920, with a few recommendations for legislative action.

AREA OF LAND ENTERED AND PATENTED.

The total area of public and Indian lands originally entered and allowed during the fiscal year ended June 30, 1920, is 16,437,491.55 acres, not including 422,984.44 acres embraced in finals not heretofore counted as original disposition of land. The latter area is constituted as follows: Public auction, 174,499 acres; abandoned military reservations, 6,414.91 acres; cash and private sales, individual claimants and small holding claims, 219,498.19 acres; preemption entries, 10,456.56 acres; soldiers' additional homesteads, 12,115.78 acres. The area of 16,437,491.55 acres is an increase of 4,566,310.05 acres, as compared with the area originally entered and allowed during the fiscal year 1919. Of the total area originally entered and allowed during the fiscal year, 8,103,844.81 acres were allowed under the stock-raising homestead act of December 29, 1916.

The area patented during the fiscal year is 11,850,401.337 acres, an increase of 1,073,399.988 acres, as compared with the fiscal year 1919. Of the above area 9,239,903.257 acres were patented under the homestead laws, an increase of 927,584.369 acres, not including as homesteads 11,666.546 acres patented as soldiers' additional entries.

CASH RECEIPTS AND EXPENDITURES.

The total cash receipts from the sales of public lands, including fees and commissions (\$1,587,060.79), sales of reclamation town sites (\$124,147.26), sales of lands and timber in the Oregon and California railroad grant (\$184,168.10), and sales of lands and timber in the Coos Bay wagon road grant (\$80,811.30), for the fiscal year 1920 were \$3,974,979.17. The total receipts from the sales of Indian lands were \$2,063,186.06. Other receipts aggregated \$93,611.18. The total receipts of this bureau during the fiscal year 1920 were \$6,131,776.41.

The total expenses of district land offices for salaries and commissions of registers and receivers and incidental expenses during the fiscal year ended June 30, 1920, were \$855,752.18. The aggregate expenditures and estimated liabilities of the public land service, including expenses of district land offices and surveys made from the appropriations for surveying the public lands outside of railroad land grant limits, were \$3,364,919.96, leaving a net surplus of \$2,766,856.45 of receipts over expenditures. Disbursements from the following special deposit trust funds and reimbursable appropriations are not included in the above figures as receipts or expenditures: From deposits by individuals for surveying the public lands, \$67,771.40; from surveying within land grants (reimbursable), \$16,781.65; from opening Indian reservations (reimbursable), \$6,325.22; from deposits by individuals for resurveys, \$745.47; from deposits for surveys of private lands, \$601.82; and from surveying and allotting Indian reservations (reimbursable), \$84,517.77.

THE FIELD SERVICE.

The sum made available for the field service for this year was \$500,000. The average number of field employees, in addition to the nine chiefs of field division, maintained under this appropriation during the year was 98, and in addition thereto the cost of maintenance of offices of the chiefs of field division and the clerical assistance required for them was paid from this appropriation.

The total amount of cash collected and turned in to the Treasury as the result of the work of the field force during the fiscal year was \$131,342.06; of this amount, \$35,519.62 was in settlement of timber trespass cases, and \$13,852.68 was secured from timber sales; \$81,969.76 was recovered through civil and criminal action brought by the Department of Justice in cases of depredations on the public lands and violations of the public-land laws. In addition there has been turned into the Treasury \$5,767.11, which represents royalty on coal mined during the past year from a tract in Colorado. This tract had been patented, but title thereto was recovered through suit, and under the decree of court the lessee from those deriving title from the patentee was protected, and the Government therefore now stands, while this lease runs, in the position of lessor.

As a result of investigations by the field employees, 137,250 acres have been restored during the year to the public domain. Of this amount, 88,160 acres represent fraudulent entries (taking an average of 160 acres to each entry), canceled through proceedings based upon special agents' reports; 49,090 acres restored to the open range by the abatement of unlawful inclosure without suit.

Special agents have investigated and reported on 20,865 cases, 3,794 of which were adversely and 17,071 favorably reported.

Three hundred and thirty-two hearings in Government contest cases have been held.

Civil suits in 64 cases were recommended to the Department of Justice as the result of investigations made during the year. One hundred and nine were tried in court, of which 82 were won and 27 lost. As the result of the successful prosecution of these suits, \$79,868.76 was recovered and 43,708 acres were restored to the public domain, of which 40,345 acres had been unlawfully inclosed.

Of the criminal cases tried during the year, 36 resulted in convictions, under which there were 11 prison sentences imposed and fines amounting to \$2,101 paid.

The accomplishments of the field service for the past year compare favorably with those of the preceding years. In the year ending June 30, 1919, the average number of traveling field employees, in addition to the chiefs, who do little traveling, was reported to be 97. The average for the year just closed was 98. The number of investigations completed and closed in 1918-19 was 17,399, while in the past year the number of such cases amounted to 20,865.

There are 17,653 cases pending for investigation in the field, a number of which involve large areas of land alleged to have been secured through "dummy" entries, and State and railroad selections, to be examined to determine the mineral or nonmineral character, and 892 school sections in place, an approximate area of 570,880 acres.

By reason of the greatly increased cost of railroad transportation and of all classes of supplies, the expense of maintaining our force of field agents and employees in its present high state of efficiency is becoming a difficult problem. It is believed, however, that the greater number of those now employed will "carry on," hoping for more favorable conditions next year. It will then be necessary either to have an increased appropriation or to reduce the force of agents and other employees, to the detriment of the public-land claimants entitled to have their cases acted on promptly and intelligently.

The work of our field service is no longer only a matter of examining public-land claims to see that the requisite residence, cultivation, improvements, reclamation, or other compliance with the requirements of the law have been made. The public-land legislation of recent years has made it necessary to add to our field force a corps of men having technical qualifications along the various lines of mining, reclamation, hydraulic and chemical engineering, geology, gauging, accounting, and valuation work. It has been difficult to acquire the services of men having these qualifications for the low salaries we have been able to pay them, or, after employing them, to

retain their services for any considerable time, as, after the experience obtained in our field work, they are in great demand among commercial enterprises offering them more lucrative positions.

Mention is here made of some of the more important cases handled by the field service and brought to a final conclusion, some of which investigations were made in cooperation with the Department of Justice. Approximately 100,000 acres, known as the sunk and lake lands of Arkansas, have been made available for settlement, some of which is alleged to be now worth \$150 per acre. The suit against the Southern Pacific Railroad Co., in what is known as the Elk Hills cases in California, was decided in favor of the Government by the Supreme Court of the United States. The suit involved an area of 6,107.17 acres of oil lands, the estimated value of which is more than \$10,000,000. Decisions in favor of the United States were rendered in nine oil suits in California, aggregating 1,396.79 acres, with money judgments of \$2,977,077.26, receivership funds of \$6,537,226.74, a total of \$9,514,304. A suit at law was filed against the Grand Ronde Lumber Co., an Oregon corporation, to recover damages in the sum of \$685,943.26, being the value of the land and timber embraced in 153 timber and stone and homestead entries.

In Utah compromise effected in suit against the Denver & Rio Grande Fuel Co., and payment of \$44,244.55 made in settlement.

Verdicts in favor of the Government in Wyoming in three suits against the Higgins Sheep Co. et al. in the sum of \$27,400, approximately 3,000 acres involved.

Suits filed in Wyoming against the La Bonte Live Stock Co. et al. to recover value of land, \$28,000, and rental value, \$4,700. Approximately 2,700 acres involved.

May 10, 1920, Circuit Court of Appeals, Ninth Circuit, affirmed the decision of the lower court awarding damages to the Government to the amount of \$18,204.98 in a suit against Willard N. Jones for the value of lands, patents to which were secured through veterans of the Civil War for the use and benefit of said Jones.

Among the most important indictments returned during the year were:

Ten in Missouri for conspiracy to defraud the United States and for using the mails for the operation of a fake shale scheme, three in Colorado for intimidation, two for embezzlement in Idaho, one for submitting false accounts in New Mexico, one for coal trespass in North Dakota, two for using mails to defraud in Washington.

Convictions of importance during fiscal year.—Five in California for using the mails to defraud and fines of \$3,250 imposed; two in California, under sections 28 and 37, and fines of \$3,500 imposed and prison sentence imposed; two in Colorado for intimidation; one in Idaho for embezzlement of Government funds, and 18 months in peni-

tentiary and fine of \$2,662.67 sentence imposed; two convictions in Montana for conspiracy to prevent citizens from the peaceable enjoyment of civil rights, fine of \$500 and imprisonment 1 year and 1 day in one case and fine of \$100 and 30 days in other case; four convictions also for conspiracy in Montana and fines of \$1,900 imposed; one conviction in New Mexico for impersonating Government agent, sentence, 4 months in penitentiary; two convictions in Washington for using mails to defraud, sentence of 15 months in each case.

Motor-propelled vehicles.—In view of the constantly increasing cost of hired automobiles, provision was made in the 1920 appropriation for protecting public lands and timber for the allotment of \$20,000 for the purchase and maintenance of motor-propelled vehicles. From this fund 16 automobiles were purchased. The number of miles traveled with Government-owned autos was 96,445, at a total cost of \$10,094.33, which included all operating expenses plus depreciation, or an average cost of $10\frac{1}{2}$ cents per mile. The expense of hired autos was \$65,737.48 for 278,712 miles traveled, or an average cost of $23\frac{1}{2}$ cents per mile.

It will be seen that the expense of necessary automobile transportation in Government-owned machines appears so far to be less than half that incurred by the use of hired machines, mile for mile. The loss sustained by the occasional paralleling of railroad lines is doubtless offset by the saving of auto hire while the machine is idle waiting for field examinations to be made.

The transportation expenses of \$131,700 for the year ending June 30, 1918, was reduced last year by the amount of \$8,700, with practically the same number of agents employed. This material reduction has been due to the use of Government-owned autos. On the whole, this looks favorable to the use of Government-owned machines.

These calculations do not include a motor boat that has been purchased and is being used very satisfactorily on the watercourses of the valley of the Yukon in Alaska.

The appropriation for the protection of public lands and timber for the fiscal year 1921 allots the sum of \$25,000 for the purchase and maintenance of motor-propelled vehicles for the use of our field service, and from this allotment nine additional automobiles have been purchased.

Cost of field work.—The \$3.50 per diem allowed by law in lieu of subsistence has been proven to be inadequate and much of the time does not meet the actual subsistence expenses of the men. Persistent efforts were made to induce Congress to raise this per diem allowance to \$4, the lowest rate allowed most other field services, but without avail.

The present force of field men is 88, and with an average force of from 98 to 100 men for the past two years we have only been able to about break even in the matter of investigation of cases. The investigation of cases in the field is from six to eight months in arrears at this time. In view of the increased cost of operating expenses we will not be able to carry more than our present force of field men under the appropriation heretofore made. In order to take prompt action upon the large number of applications for oil leases under the relief provisions of the new leasing law, as well as applications for prospecting permits, and to expedite the work generally, and make the same current, additional funds will be needed for the present fiscal year 1921 as well as an increased appropriation for the fiscal year 1922.

OIL-LAND CLAIMS.

CALIFORNIA.

The status of the withdrawn oil lands in California embraced in mineral applications for patent, and the unentered lands involved in suits by the Government is shown in the following tabulation:

LANDS OUTSIDE OF NAVAL RESERVES.

	Number.	Acres.
Awaiting field examination.....	2	280
Awaiting office action on reported investigation.....	2	320
Awaiting termination of adverse suits.....	3	640
Pending before register and receiver on adverse proceedings.....	8	1,768.40
Hearings completed.....	6	1,160
Awaiting decision of register and receiver.....	2	490
Awaiting completion of hearing.....	6	1,288.40
Pending in General Land Office on hearing record.....	15	1,987.78
Pending before Secretary on hearing or motion.....	22	3,494.13
Patented.....	5	680
Canceled.....	1	480
Now pending.....	54	8,784.38
Lands in these entries involved in suits by Government.....	14	2,162.06
Unentered lands involved in suits by Government.....		2,516.79

LANDS IN NAVAL RESERVE NO. 1.

Pending before register and receiver on adverse proceedings.....	10	4,532.95
Awaiting completion of hearing.....	10	4,532.95
Now pending.....	10	4,532.95
Lands in these entries involved in suits by Government.....	1	160
Unentered lands in Naval Reserve No. 1 involved in suits by Government.....	1	160

LANDS IN NAVAL RESERVE NO. 2.

Pending before register and receiver on adverse proceedings.....	16	4,485.10
Awaiting completion of hearing.....	16	4,485.10
Pending before Secretary on appeal or motion.....	16	2,738.50
Now pending.....	32	7,223.60
Lands in these entries involved in suits by Government.....	32	7,223.60
Unentered lands in Naval Reserve No. 2 involved in suits by Government.....		900.89

SUMMARY.

	Number.	Acres.
Awaiting field examination.....	2	280
Awaiting office action on reported investigation.....	2	320
Awaiting termination of adverse suits.....	3	640
Pending before register and receiver on adverse proceedings.....	34	13,786.45
Hearings completed.....	6	1,160
Awaiting decision by register and receiver.....	2	480
Awaiting completion of hearing.....	32	10,306.45
Pending in General Land Office on hearing record.....	15	1,987.78
Pending before the Secretary on appeal or motion.....	38	6,232.63
Patented.....	5	680
Canceled.....	1	480
Now pending.....	96	20,540.98
Lands in these entries in suits by Government.....	47	9,545.66
Unentered lands involved in suits by Government.....		3,477.68

At the end of the year arrangements had been made for decision before August 25, 1920 (the end of the six months' period during which application for relief might be filed under the leasing act), in practically all cases in which the testimony had been taken and the case submitted; as to nearly all other cases in which hearings had been ordered it was understood that applications for relief would be filed.

During the fiscal year decision was rendered by the United States Supreme Court in favor of the Government involving 6,109.07 acres in naval reserve No. 1 in the suit against the Southern Pacific Railroad Co., to set aside the patents issued to said company. Decision favorable to the company was rendered as to six suits, involving 101,280 acres, brought by the Government to set aside the patents theretofore issued for said land, in the District Court, Southern District of California, and became final, as the Government decided not to prosecute an appeal.

During the year judgment in nine suits by the Government against claimants of withdrawn oil lands were rendered, involving total money judgments of \$2,097,777.26, and total receivership funds of \$6,537,226.74, a grand total of \$9,514,304.

WYOMING.

During the fiscal year there were no additional oil withdrawals made and none of the withdrawn lands were restored. On June 30, 1920, 1,180,987 acres were embraced within the existing withdrawals. Within this area 18 new applications for patent were filed during the fiscal year embracing 2,880 acres. Four applications, embracing 587 acres, were rejected, 2 applications, embracing 280 acres, were relinquished, and a lease was granted under the provisions of the relief sections of the act of February 25, 1920 (Public, No. 146), and 3 applications, embracing 400 acres, were patented. At the end of the year there were in all 61 applications, embracing approximately 9,760 acres, pending.

OIL CONTRACTS.

Nine contracts, covering approximately 840 acres, in the Salt Creek oil field, Wyoming, under the act of August 25, 1914 (38 Stat. 708), were in operation at the end of the fiscal year. Under three of these contracts surety bonds, covering an agreed maximum liability, were filed in lieu of the deposits in escrow, but during the past year supplemental contracts were entered into providing for the impoundment of the gross proceeds of production, less a fixed sum per barrel allowed as the cost of operation, such impoundment to be effective as of September 10, 1918. The deposits have been made in accordance with the agreement and operations are being conducted on the full impoundment basis. During the fiscal year no new operating agreements were entered into.

The total production in Wyoming under these various agreements, from the date the agreements were entered into up to and including June 30, 1920, was 10,633,963.75 barrels of crude oil, 422,681,493 metered feet of gas, and the escrow deposits, or equivalent in surety bonds, amounted to \$5,259,459 at the end of the fiscal year.

Operations are being carried on upon two 80-acre tracts in the Grass Creek oil field by parties asserting claim thereto under leases from the State. These tracts are not included in mineral applications or covered by agreements under the act of August 25, 1914; but one of them is involved in a suit brought by the United States, decision favorable to the Government was rendered during the past year in the Circuit Court of Appeals, and the case is now pending on appeal in the United States Supreme Court. The operations have been conducted under an understanding providing for the impoundment of the gross proceeds of production, less an allowance for operating expenses. The total production from these tracts from the beginning of operations under the understanding to the end of the fiscal year amounted to 1,694,243.92 barrels of crude oil, 463,101.98 barrels of vapor, and 26,446,200 metered feet of gas, and the total escrow deposits arising from the sale of these products amount to \$2,857,802.46.

On another tract in the Salt Creek oil field, covered by an application for patent, against which proceedings are pending in this department and ancillary suit in the Federal court, these operations are conducted under an arrangement effected between the operators and the Department of Justice in the nature of a receivership.

At the end of the fiscal year there were 38 contracts under the act of August 25, 1914 (38 Stat. 708), embracing 4,085 acres, in operation in California. Nine of these are supplemental contracts providing for the disposition of proceeds impounded prior to entering into the original agreements. No new agreements were made during the fiscal year, but two were terminated through the issuance of

patent for the lands covered by the agreements. The total production from the tracts covered by these contracts from the time same were entered into up to June 30, 1920, amounted to 10,640,808.95 barrels of oil, 853,040,498 metered feet of gas, and 870,812 gallons of gasoline, and the escrow deposits thereunder amount to \$1,795,136.94.

The total production in both Wyoming (including Grass Creek) and California under these agreements amounts to 22,969,016.62 barrels of oil and \$9,912,398.40 escrow deposits.

APPLICATIONS UNDER RELIEF SECTIONS OF LEASING LAW.

Since the enactment of the leasing law of February 25, 1920 (Public, No. 146), 28 applications for lease or permit under the so-called relief sections 18, 18a, and 19, embracing 10,331.01 acres, have been filed, 20 of these concerning lands in Wyoming, 7 in California, and 1 in New Mexico. Of these, 18 applications were filed under section 18a, 5 under section 18, and 5 under section 19. Final action has been taken in two cases. In one case, filed under section 18a, a lease was granted embracing 280 acres in Wyoming, and in one case involving an offer of compromise affecting lands inside naval reserve No. 1 in California, and other lands outside said reserve, upon which claims were asserted based on alleged discovery of fuller's earth the department declined to recommend acceptance of the offer of compromise and settlement.

In accordance with the regulations under the leasing law the boundaries of geological structures of certain producing oil fields have been determined and announced by the United States Geological Survey covering eight fields in Wyoming of a total area of 73,328 acres and one field in Montana of an area of 47,205 acres:

"FERRY" OR "CADDO LAKE" OIL LANDS IN LOUISIANA.

The previous annual report contained a résumé of the status of the suits involving certain public oil lands within the "Ferry Lake" or "Caddo Lake" oil field of northwestern Louisiana. Seventeen of the eighteen suits in which the Government obtained favorable decisions in the United States District Court, Western District of Louisiana, are now pending on appeal before the United States Circuit Court of Appeals. One suit, that of W. H. Enders et al. v. United States, was dismissed by the Circuit Court of Appeals on July 16, 1920, upon motion of the appellants.

The Enders case was one of the group which involved alleged claims under the placer mining laws, and from the standpoint of money valuation was not as important as some of the other suits. The subject matter of the controversy comprises approximately 66

acres of oil-producing lands, described as lots 5 and 6, sec. 9, T. 20 N., R. 16 W., which are now being operated by a receiver appointed by the court. The dismissal of the suit has the effect of nullifying the mining claims, and also gives to the Government possession of the oil production and a money verdict for \$1,577.24 and costs.

On July 12, 1919, four suits were instituted in the United States District Court, Western District of Louisiana, styled *United States v. Standard Oil Co. of Louisiana et al.*, *United States v. Higgins Oil & Fuel Co. et al.*, *United States v. Gulf Refining Co. of Louisiana et al.*, and *United States v. Sun Co. et al.*, to recover possession of 160 acres of land described as the SE. $\frac{1}{4}$ sec. 9, T. 21 N., R. 16 W., Louisiana, and to obtain an accounting for oil to the alleged value of \$317,919.38 extracted therefrom. Decisions have not yet been handed down in those suits.

The relief provisions contained in sections 18 and 18a of the act of February 25, 1920 (Public No. 146, 66th Cong.), entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain," were so restricted in terms that they are not applicable to any of the claims in the "Ferry Lake" oil field. On March 3 (calendar day, March 4), 1920, a bill, S. 4013, which proposes to amend the act of February 25, 1920, so that the relief provisions contained therein shall be applicable to oil claims in the State of Louisiana, was introduced in the Senate. At the time that Congress adjourned the bill was still pending before the Public Lands Committee, to which it had been referred.

ARKANSAS "SUNK LANDS" AND "LAKE LANDS."

The work involving the adjudication of the so-called "lake" and "sunk land" cases has passed beyond the experimental or doubtful stage and has now reached the point where it has become necessary to administer the final disposition of these lands pursuant to the various public-land laws applicable thereto. In other words, the title, which has been quieted in the Government as the result of litigation that was pending in the Federal courts for several years, is being transferred to private ownership, so that within a comparatively short time the United States will have no further interest in the lands. The history and progress of these cases have been published in previous annual reports, and it is therefore merely necessary to continue here from the point at which the report for the fiscal year ended June 30, 1919, concluded.

DECREES BECOME FINAL.

Since the issuance of the last annual report, in which the salient points were given in detail, final decrees have been entered by the

United States District Court, Eastern District of Arkansas, in the suits of *United States v. Chapman & Dewey Land Co. et al.*, equity No. 49, and *United States v. John W. Walker et al.*, equity No. 51.

GOVERNMENT WINS BIG LAKE SUIT.

March 11, 1920, a decree was entered in the United States District Court in favor of the Government quieting title to an area comprising 22,514 acres, conservatively valued at approximately \$1,000,000, locally known as "Big Lake," situated just south of the Missouri boundary line, in Mississippi County, Ark. The suit was entitled *United States v. Chicago Mill & Lumber Co. et al.*, equity No. 53, which was instituted October 25, 1917, upon recommendation of the land department. As in the other suits, the question at issue was the correctness or incorrectness of the original survey of the adjoining lands and of the proper establishment of the meander line. The Big Lake area had previously been involved in a suit, *Harrison v. Fite* (148 Fed. 781), to which the Government was not a party, however, in which the United States Circuit Court of Appeals decided that the unsurveyed lands within the bed of the lake had formed by the process of accretion or reliction since the original survey. In the suit of *United States v. Chicago Mill & Lumber Co.* the Government successfully established the fact that the findings in the suit of *Harrison v. Fite* were erroneous and that the decision of the Circuit Court of Appeals was not *res judicata* as against the United States.

BAGWELLS LAKE SUIT DECIDED.

On June 7, 1920, the United States District Court for the Eastern District of Arkansas ordered that a decree be entered favorable to the Government, quieting title to approximately 625 acres within an area locally known as Bagwells Lake, Ark. The suit is identified as *United States v. Morris & Co. et al.*, equity No. 57. The Bagwells Lake area comprises approximately 2,260 acres and is a portion of the so-called St. Francis River sunk lands. For tactical reasons, however, it was not included in the principal sunk land suit, *United States v. Chapman & Dewey Land Co. et al.*, equity No. 49.

In 1893, which was long prior to the survey of the so-called sunk lands by the Government, in fact prior to the time that the land department had asserted title to the lands, a private survey was made of the Bagwells Lake area and the State sold 1,560 acres, evidently upon the assumption that it would later acquire title to the lands under the swamp-land grant. A number of sales of other similar areas had been made by the State. In 1898 Congress incorporated into an act the terms of an agreement entered into between the United States and the State of Arkansas, known as the Arkansas

compromise, whereunder the State relinquished all further claim to swamp lands that had not already been approved or confirmed, with a proviso, however, that title to unsurveyed areas, such as the Bagwells Lake area, that had previously been sold by the State be confirmed in the purchasers.

The General Land Office supposed for a number of years that the State had sold the whole of the Bagwells Lake area and that the Government had no title to or interest therein. Later it was discovered that approximately 700 acres had not been sold, and thereupon title was declared to be still vested in the United States. The Supreme Court of the State of Arkansas, in the case of *Glasscock v. National Box Co.* (104 Ark. 154), however, practically nullified the so-called compromise act, in so far as it was intended to be applicable to the Bagwells Lake lands, by holding in effect that no title had been acquired through the purchase from the State, since to hold otherwise would interfere with the rights of riparian claimants who had purchased the adjoining surveyed lands on the faith that the work of the surveyors who returned the area as lake was correct. This decision was responsible for more or less confusion as to the true ownership of the lands that the State had sold, in that the Government was contending that the riparian claimants had no title thereto, and on the other hand the land department had recognized that the purchaser from the State had a good title by virtue of the compromise act. In order that the status of the lands might be authoritatively determined, the suit which the Government instituted was made to include the whole of the Bagwells Lake area, but without expectation of obtaining a decree for that portion which the State had sold in 1893. The decision of the United States district court sustains the views of the Land Department and gives a good title to those claiming through the State, thereby abrogating the effect of the decision of the State supreme court in the case of *Glasscock v. National Box Co.*, and it gives to the United States practically all of the lands which it was contending for. The decree has not yet become final, owing to the fact that the period within which an appeal may be entered has not terminated.

NEW SUITS INSTITUTED.

Bills of complaint have been filed since the last annual report in the United States District Court for the Eastern District of Arkansas seeking to quiet title in the United States to areas locally known as "Golden's Lake" and "Young's Lake," situated in Mississippi County, Ark. The suits are styled *United States v. J. W. Rhodes et al.* and *United States v. Sue H. Lovewell et al.* The defendants are asserting title adversely to the Government by virtue of the doc-

trine of riparian ownership, and the plaintiff is contending that the original surveys were erroneous in that the areas were returned as lakes when they in fact comprised lands in place that should have been surveyed with the adjoining lands.

It is alleged in the bills of complaint that the areas involved in the suits comprise 3,265.13 acres and 2,188.73 acres, the values of which exceed \$300,000 and \$100,000, respectively. Title to the lands was asserted on behalf of the Government in land department decisions rendered August 2, 1917, and December 31, 1917. The so-called lake areas are covered with homestead settlers, who recently were allowed to file entry applications; and, inasmuch as it has been alleged that these settlers have been and are being harassed and ousted by the riparian claimants, the Government is also seeking to have the defendants enjoined during the progress of the suits from cutting and removing any of the timber on the lands and from further interfering with the peaceable possession of the settlers.

RECENT LAND DEPARTMENT DECISIONS.

On June 30, 1920, decisions were rendered by the General Land Office, which were approved by the department, holding that the title to certain unsurveyed areas situated in northeastern Arkansas, and locally known as "Bearfield Lake," "Cypress Lake," and "Dismal Lake," is vested in the Government, on the ground that those so-called lake areas were not in fact lakes, but were lands in place that should have been surveyed with the adjoining lands when the original surveys were made about 75 years ago. The areas comprise about 180 acres, 600 acres, and 1,000 acres, respectively, and the surveys thereof have been directed. The cases were initiated by alleged settlers upon the lands who filed applications to have them surveyed and opened to homestead entry.

SURVEY OF HUDGENS AND MILL LAKES DENIED.

Reference was made in the previous annual report to the decision rendered by the General Land Office April 23, 1919, denying an application for the survey of lands within Hudgens and Mill Lakes. On June 18, 1920, the Department of the Interior, to which the matter had been submitted on appeal, affirmed the holding of the General Land Office.

PLATS OF RECENT SURVEYS APPROVED AND FILED.

Plats have recently been approved and filed in the United States land office at Little Rock, Ark., showing as public lands areas locally known as Swan Lake (630.81 acres), Carters or Crater Lake (1,558.20

acres), Round Lake (603.07 acres), Golden Lake (4,364.64 acres), Youngs Lake (2,188.73 acres), portions of Little River (580.94 acres), and portions of Pemisco Bayou (184.66 acres). The lands within Little River, Pemisco Bayou, Carters Lake, and about half of Swan Lake have been opened to homestead entry. The other half of Swan Lake is within a township that has been withdrawn pending the adjustment of an alleged faulty or incomplete survey. The lands within the Round Lake area and within a portion of the Golden Lake area are to be disposed of by the Government under special acts of Congress approved March 4, 1919 (40 Stat. 1577), and January 17, 1920 (Private No. 21). The balance of the Golden Lake lands and the Youngs Lake lands have been withdrawn by the Department of the Interior pending the outcome of litigation to determine the question of title. The numerous settlers upon the lands have been accorded the privilege, however, of filing entry applications, but said applications have been suspended until the question of title shall be finally decided.

INVESTIGATION OF NARROW STREAM AREAS.

Mention was made in the previous annual report of an investigation that was directed for the purpose of determining the question of title to certain narrow stream areas in T. 10 N., Rs. 7 and 8 E., Arkansas. That investigation has been partly made. The work had to be temporarily abandoned, however, prior to its completion, owing to unfavorable climatic conditions. It will be completed during the forthcoming fiscal year. During the past year quite a number of new cases involving the question of title to narrow stream areas in other townships of Arkansas have been presented to the Land Department in the form of applications for surveys, but action on nearly all of these cases has been postponed until it shall have been determined what action is to be taken in the case involving the unsurveyed lands in T. 10 N., Rs. 7 and 8 E., since it is considered that the decision in that case will doubtless influence the line of action that will be pursued in other similar cases.

MUSGRAVE BAR.

A case involving the question of title to an area comprising approximately 3,200 acres of unsurveyed lands locally known as "Musgrave Bar," adjacent to fractional T. 15 N., R. 13 E., Arkansas, and partly bounded by the Mississippi River, is now awaiting a decision. A hearing has been held at which a great amount of testimony was taken. The State of Arkansas, under supposed authority of an act passed by its legislature, sold the Musgrave Bar lands to private parties upon the theory that the lands had formed first as an island

in the Mississippi River subsequently to the date of the admission of the State into the Union, and that the bar gradually increased in size as the result of accretions until it became a part of the mainland; that having thus formed, the title thereto became vested in the State by virtue of her sovereignty over the beds of navigable waters and over islands and lands forming therein subsequently to date of admission. On the other hand, homestead settlers have gone upon the lands and have filed an application for survey, alleging that the lands were lands in place at the date of the admission of the State, and that they should have been surveyed by the Government at the time that the adjoining lands were surveyed. In order that a correct decision may be rendered, it becomes necessary to ascertain the true conditions in 1836, the year that the State of Arkansas was admitted into the Union.

RESULTS ACCOMPLISHED.

The Arkansas "sunk-lands" and "lake-lands" litigation has been wholly favorable to the Government. Fourteen suits have been won quieting title in the United States to approximately 60,000 acres of so-called sunk lands and approximately 44,000 acres of so-called lake lands, conservatively valued at \$5,200,000. The land department has also asserted title to approximately 10,000 acres of so-called lake lands in Arkansas, valued at \$1,000,000, additional to those mentioned above. The Government has recovered the aggregate sum of \$50,000 for the value of timber cut in trespass from the lands involved in the suits.

SURVEYS.

THE DIRECT SYSTEM.

June 25, 1920, marked the tenth anniversary of the inauguration of the direct system of surveys. By act of Congress approved June 25, 1910, the old system of surveying the public lands by contract was discontinued and the work placed under the direct supervision of the commissioner. The wisdom of such a step was manifest to all, but perhaps comparatively few, even in later years, understood and fully appreciated the absolute necessity for Congress making some change in system about that time that would insure a proper continuance of the work of surveying the public lands. The immense areas embraced by the Middle States had been surveyed in their entirety long ago; the fertile valleys and rich plateaus of the Rocky Mountain, intermountain and Pacific States had been covered in large measure by the rectangular net, and even the desert waste and mountain wilderness of the lands "that God forgot," seemingly secure from the desire of man, had received their share of attention in no small de-

gree in the matter of survey under special laws, where the general appropriation, the use of which is restricted largely to surveys for settlement, did not apply. This vast expanse of the earth's surface had been surveyed under the contract system and much of it had been settled upon and passed to private ownership. Many of these earlier contract surveys were well executed and faithfully served the purpose for which they were intended. There were a number, however, especially in the Rocky Mountain States before the days of efficient field inspection, that were hastily and carelessly made, and a small number that were fraudulent and mythical. The gross errors in, and occasionally the absence altogether of, these latter surveys were usually never discovered until after the country to which they related began to be settled upon, or when new surveys were to be initiated therefrom.

Thus in the year 1910 public-land surveying had assumed some entirely new and unlooked-for aspects. The great expanse of virgin prairie, of level, treeless plains, of open bench land, of wooded hills, and of profitable State and reservation boundaries, for the survey of which there had been lively competition amongst contracting surveyors, had been practically completed throughout the entire United States. The business of surveying the public lands in its generally accepted sense, the comparatively simple process of "sectionizing" the country, a process that had been employed for a century and a quarter, was approaching its final stages for want of new worlds to conquer. Surveys of fragmentary and remotely situated groups and of isolated tracts in the rougher country were beginning to require more attention. The location and acceptance of initial and control lines, which had been always considered as mere incidents of the survey, were becoming problems fraught with uncertainty because of obliteration or the mythical character of the surrounding surveys. Engineers of standing were loth to risk their fortunes and their reputations on such work on a contract basis. As a consequence, in every State there were numbers of complicated, isolated, fragmentary surveys which no qualified surveyor would undertake to execute by contract. But the work must be done and the contract system was still in force. Finally a per diem system of payment was worked out whereby the surveyor contracted to complete a survey at a stipulated amount a day for a limited number of days. This system took care of a few of the more favorable cases, but the great majority remained untouched. Furthermore, the necessity for executing resurveys in certain of the States—Colorado, Wyoming, and Nebraska in particular—was becoming more urgent. Few engineers were qualified by training to perform this intricate and painstaking class of work, and those who were equipped hesitated to undertake it under contract, even under the newly inaugurated per diem form of contract, on

account of the uncertainty as to even the approximate extent of retracement and reestablishment that would be necessary in order to find and establish a proper base for the work, and the utter guesswork as to possible conflicts of claims and other survey complications that might develop with the progress of the resurvey. The old contract system had served its period of usefulness and would have died in a short time anyhow of natural causes had not Congress by one stroke on June 25, 1910, abolished it by inaugurating the direct system.

The idea of a direct system of surveying the public lands was not new in 1910. It had been hinted at and suggested from time to time for many years past as the only system under which the public lands should be surveyed. President Cleveland, however, first put the idea in concrete form in his second annual message to Congress on December 3, 1894. He said:

The suggestion that a change be made in the manner of securing surveys of the public lands is especially worthy of consideration. I am satisfied that these surveys should be made by a corps of competent surveyors under the immediate control and direction of the Commissioner of the General Land Office.

President Cleveland undoubtedly foresaw the inevitable end of the contract system and recommended the system that should take its place. Favorable action on the recommendation was somewhat delayed, but it was finally taken undoubtedly at a most opportune time.

ACCEPTED SURVEYS.

During the fiscal year just ended this office has received and passed upon favorably the returns of surveys and resurveys amounting to 12,478,715 acres. This is an increase of 4,810,201 acres over the area of accepted surveys for the year 1919.

The record of accepted surveys for the last 10 years indicates some fluctuations, the high-water mark being reached in 1915. The total acreage for the decade is 100,109,570 acres or an average of 10,000,000 acres per annum. This is believed to be the greatest showing for any decade, in the history of the General Land Office.

The surveys include Indian reservation subdivisions and railroad-grant surveys, for which funds are secured from other sources than the regular appropriation for surveys and resurveys. The amount of acreage shows what has been done under the salaried system inaugurated 10 years ago. A comparison of the cost per acre with that under the abandoned contract system is difficult, because at the close of the latter system it was necessary, as stated above, to contract for surveys by the day. The method provided for competition, and the competitor was at a loss to know how much per day he should submit in his proposal, owing to the uncertainty as to the extent of diffi-

culties he might encounter. The maximum rate per mile prescribed by statute was found to be too little to accomplish the survey of exceptionally rough land, and Congress granted partial relief by authorizing surveys to be paid for by the day. The bidder under the method was, however, obliged, under a comptroller's decision, to specify the actual number of days he would be at work on the line, and the result was that contracts were let sometimes for surveys in a remote region and of a mountainous nature at as high as \$175 per day for a specific period, and this after competitive bids were invited by public notices. Even with this liberal method, many instances occurred of failure to secure any proposals at all from reliable surveyors. The cost under the present system is, however, mounting, as prices for labor and material are increasing, but it is thought that the expense will come well under 10 cents per acre. The overhead charges will add something but can not well be stated as it is difficult to draw the line where the administrative expenses should cease to operate. But it may be safely concluded that the method of conducting surveys under the direct system, where carried out conscientiously and with economical management, has resulted in a saving of expense and in the production of unimpeachable surveys.

FIELD SURVEYING SERVICE.

Applications for surveys from State authorities and from settlers were somewhat greater in number in 1920 than in recent years, indicating an increasing interest in the public-land possibilities not yet identified by survey; as a consequence a larger new area was awaiting examination in the field and authorization for survey at the opening of the last season than at any time since 1916. In southeastern Oregon a large area has been designated for survey under the second preference named in the appropriation act, and in other States smaller areas of the same character of lands have been and will be shortly authorized for survey. The resurvey of many townships in Colorado, Nebraska, and Wyoming were executed, as well as an unusual number of fragmentary and special surveys, town-site surveys, and other classes of miscellaneous field work.

During the year 1920 the output of field work is reported as 25,336 miles of line, which at the equivalent standard represents 8,107,520 acres. This aggregate is independent of the acreage reported as approved in the surveyor general's office and the total amount accepted by this office. The production is a decrease from the last year's (1919) showing, due to the difficulty in securing experienced surveyors and the increased roughness of the country traversed, which occurs as the surveys are extended to embrace lands of a mountainous character.

FIELD PARTIES.

The maximum number of parties of surveyors at work at any one time during the fiscal year was 110, which was reached in September, 1919. This with an average membership of 6 to each party indicates 660 persons in the field at that period.

INDIAN RESERVATIONS.

In Arizona Indian reservations received special attention during the year. The resurvey of the west boundary of the Navajo Reservation, resurvey on Gila River Reservation, resurvey of a part of south boundary of the White Mountain Reservations, the survey of the boundaries of the Papago Reservation and the railroad grant lands in the Hualpai Reservation were included. The last named is the largest undertaking, covering nearly a million acres.

SMALL HOLDING CLAIMS.

The survey of "small holding" claims in New Mexico is about completed. These claims, numbering about 6,000, are wholly within the area acquired from Mexico by the treaty of Guadalupe Hidalgo and by the Gadsden purchase. They represent a form of land unit used by the Spanish and Mexican Governments, and although in size and shape hardly in keeping with modern ideas of land and farm units, fulfill their mission in a satisfactory manner.

FRAGMENTARY SURVEYS.

A special drive has been made during the past fiscal year to overcome the accumulated field and office work hanging over from the war period; both classes of work may now be counted as current from June 30, 1920. The year's total of approved regular surveys and resurveys covers 56,191.19 acres, representing 963 miles of surveys in 34 different townships scattered through Alabama, Arkansas, Florida, Michigan, and Minnesota. Indian surveys have been approved aggregating 55,733.66 acres, representing 699 miles of surveys in 20 townships in Minnesota, Oklahoma, and Wisconsin. Miscellaneous surveys were approved which extended into 5 townships in Iowa, North Dakota, and Oklahoma. All authorized special examinations were completed during the year; this class of work involves much labor and expense which is not reflected in the approved surveys. At the close of the fiscal year regular field work had been completed in 16 additional townships and returns were in course of preparation; most of the latter work is located in Florida and was completed late in the fiscal year; this includes all of the special resurveys provided under Public, No. 71, Sixty-sixth Congress. Also,

within the Leech Lake Indian Reservation, in Minnesota, 16 townships were drawing near to completion in the field in June, when work was suspended owing to depletion of funds; this work represented a heavy expenditure of time and money and has proven to be exceedingly necessary. All new surveys executed during the fiscal year reached a total of 1,173 miles at an average cost of \$23.64 per mile.

It is interesting to note that although the appended table of "Public lands surveyed and remaining unsurveyed" carries the States of the eastern district as completed, the actual aggregate amount of necessary field work and approved surveys exceeds any one of at least four western districts where a surveyor general's office is maintained. In this connection it is important to observe that the character of the necessary surveys changes greatly toward the completion of the work within a State. Investigation as to question of title involved in the areas surveyed becomes more and more necessary, and retracements for identification of previously established lines becomes more and more extended and complicated.

The law and administrative practice contemplate a surveyor general's office in each active public-land State, but as the survey work within a State has drawn to a close Congress has gradually abolished said offices and provided that the commissioner assume immediate jurisdiction. It is apparent that greater economy and efficiency result from concentrating in one central office the widely scattered fragmentary surveys and examinations. The General Land Office handles all matters relating to necessity for field work arising in the several inactive public-land States, and takes final action on reports of examinations or approval of field notes and plats of surveys. All matters of execution of the field work, such as preparation of necessary instructions to the surveyor, outfitting and organization of the field parties, settlement of accounts, supervision of the work while in progress, and preparation of the reports, field notes, and plats, are accomplished direct by the field surveying service. The closest cooperation exists between the central office (General Land Office) and the field surveying service; all duplication of work is avoided and the time and expense involved are reduced to a minimum.

THE WORK OF DETAILED SURVEYORS.

The accumulation of returns of public-land surveys forwarded from the offices of surveyor general for final consideration has been for several years of such proportions that the force of expert examiners here were not able until the close of the fiscal year 1920 to bring the condition of the work to a point where it could be classed as current. Congress having provided relief by appropriating money

for the employment in Washington of experienced public-land surveyors during the off season to aid the statutory examiners here, it is a source of gratification to announce that the situation is at present better than at any time within the last eight years. The examination work here of the detailed surveyors during the last fiscal year has shown a considerable improvement over the preceding year owing to the industry and efficiency exhibited by the additional force and the greater length of time they were engaged upon the work. Credit is due these surveyors for the interest shown by them and for their desire to hasten the acceptance of the surveys. The advantages accruing to the Government are the experience gained by the field men in the requirements of this office and also by the interchange of views in cases of complicated surveys and resurveys. The wisdom of invoking the assistance of our field men upon this kind of work, especially in the event of a congestion of returns awaiting attention, seems to be fairly well demonstrated, and it is recommended that the provision which authorizes the detail be continued, as it is probable that the relief which it has afforded may be again needed during the winter of 1920-21.

SURVEY OF INDIAN LANDS.

Under the provisions of section 2115, Revised Statutes, this office has for many years been charged with the survey of lands included within Indian reservations, the expenses incident thereto being generally chargeable to the appropriation for "Surveying and allotting Indian reservations, reimbursable." A review of the legislation for the past six years reveals the fact that the amount appropriated for this work has gradually decreased from \$200,000 in 1914 to \$10,000 in 1920, notwithstanding the fact that the necessity for the execution of surveys requested by the Indian Office was practically the same from year to year. In consequence of this decrease in the funds appropriated, and of the further fact that while prior to 1919 the appropriations were made available until expended the availability of the appropriation for 1920 was restricted to that year, it was found that the funds available for Indian surveys had become practically exhausted about June 1, 1920, and it was necessary to withdraw from the field the 24 surveying parties then at work on such surveys.

This unfortunate condition will preclude our resuming work on any of the Indian reservations until further funds therefor become available through appropriation to be made by Congress, which, under the most favorable aspect, could not be utilized for the resumption of field work until the opening of the surveying season of 1921. A large amount of completed field work was undergoing preparation of the field notes and plats at the time of the depletion

of the appropriation. This work has likewise suffered suspension, but can be resumed at any time that funds are made available. The advisability of estimating for a deficiency appropriation for this work is suggested to the Indian Office. It is apparent that this partially completed work will be an entire loss if not finished.

SURVEYS WITHIN RAILROAD-LAND GRANTS.

The survey of lands within the place or primary limits of the various railroad grants, which was the only branch of our surveying activities curtailed during the war, was resumed in the spring of 1919, and at the close of the fiscal year ending June 30, 1920, was engaging 20 surveying parties.

When the act of June 25, 1910 (36 Stat. 834), requiring the Secretary of the Interior to complete the survey and adjustment of these grants and to subject the granted lands to taxation, went into effect, the unsurveyed lands within the various railroad grant limits extended throughout Arizona, California, Idaho, Montana, Nevada, New Mexico, Oregon, and Washington, and aggregated probably 18,750,000 acres. That act provided a satisfactory and speedy means of securing from the companies the surveying funds to cover their moiety of the expense, but complications were encountered in providing as rapidly as was necessary the Government's share of the funds. This hampered the work for the first year or two, but the handicap was removed in 1914 by an administrative change in the accounting system, authorized by comptroller's decisions, and later by the voluntary action on the part of some of the companies in applying for the survey of their lands under the provisions of the act of February 27, 1899, and depositing the entire estimated cost.

This field of our work is now drawing to a close. There remains but one township to be surveyed in the Idaho limits, less than a township in New Mexico, while Oregon and Nevada are completely closed out. In the remaining four States there is little yet to be accomplished outside of the Hualpai Indian Reservation, Ariz. All of these unsurveyed lands, including said reservation, have been grouped for survey and the special instructions for the field work approved, except for a few isolated tracts in California, such as around Mount Shasta and Castle Crags, heretofore returned as unsurveyable. By the close of the present surveying season this work will be reduced to but a few townships in the roughest portion of the Cascade Mountains in Washington, which will have to go over to another summer. Thus the present calendar year will witness the practical finish of the great task intrusted to this office.

SUMMARY OF REPORTS OF SURVEYORS GENERAL.

ALASKA.

The surveyor general reports having approved returns of public-land surveys amounting to 612.28 miles of established lines representing 18 full and fractional townships, an increase over last year of 7½ per cent. The field cost (\$44.01) shows a reduction of \$9 per mile, and the office cost (\$3.67) was 50 cents per mile less than in 1919. In the mining branch 11 surveys were approved, covering 169 locations, at an office cost per location of \$14.31, as against \$18.83 last year; approved 21 forest homestead surveys, as against 5 forest homestead surveys in 1919. The office cost per survey was \$6.67, about \$2 less than last year. Miscellaneous surveys by United States deputy surveyors were disposed of as follows: Approved and forwarded to General Land Office, 21; approved 3 surveys by United States surveyors, such as town sites, homesteads and Indian allotments, and issued 63 special instructions during the year; received \$281.15 for copies of records, for 1922 an apportionment of \$100,000 is recommended for surveys in Alaska, with the following statement:

The area of Alaska and the extent of the unappropriated and unsurveyed lands are so well known that it is thought superfluous again to refer to it. With the completion of the Government railroad, traffic is necessary if the road is to be operated at a profit. This calls for settlers along its lines within distances permitting the use of the road, and efforts are being made to induce such settlements. The first concern of a settler is in the title of his homestead or land, and before title can be given the land must be surveyed. This requires extending the rectangular surveys along the lines of the railroad and over areas that are tributary to it in both the Susitna and Tanana Valleys. There are, also, isolated settlements between the rectangular surveys of these valleys that should be surveyed and referred to either the Seward or Fairbanks meridians. Such settlements exist and should be cared for, even if it involves the surveying of noncontiguous townships. In extending the rectangular surveys, only the best and most adaptable land for cultivation should be surveyed; tracts of swamp land, that may in the future be drained and brought under cultivation, should not be surveyed at this time. This plan should be followed, even if it results in the survey of fractional townships. The surveys in the Chilkat Valley should be further extended along the Klehini River to the international boundary line. There are many small agricultural settlements in close proximity to the larger towns and mining centers, where a ready market for products is found, that should be surveyed, even if it becomes necessary to establish an independent base and meridian.

The number of applications for the survey of homesteads under the provisions of the act of Congress approved June 28, 1918 (40 Stat. 632), has increased over last year, and it is expected that the increase will continue as it becomes known that such surveys are made by the Government without expense to the settler. The survey of Indian allotments will also increase for the same reason. There are now more outstanding instructions than can be surveyed by one crew of surveyors assigned to the work during the present surveying season. There is a great deal of fine pasture land in the valleys of southeastern and southwestern Alaska, and it has been demonstrated that stock can be profitably raised, red top and other nutritious grasses being abundant. Kodiak Island, where probably the greatest number of settlers is to be found, and Eagle River Valley, where the settlers find ready market in Juneau, are the most in need of surveys at this time. While it is desirable that where there are a number of settlers the rectangular surveys be extended to embrace such settlements, there are many isolated tracts to be surveyed, and it will be necessary to survey them as such. In making such isolated surveys it is recommended that the location monuments to which the surveys are connected be tied by course and distance to one of the triangulation stations of the United States Coast and Geodetic Survey whenever it is practicable to do so. In view of the conditions herein stated it is considered that the estimate of \$100,000 for the surveying service of Alaska in 1922 is conservative.

ARIZONA.

The surveyor general reports that his office has approved the returns of 3,201½ miles of public-land surveys during 1920 and 1,780½ miles of railroad-grant surveys. This is a decrease of 300 miles from the record of 1919 for public-land surveys and 6,889 miles of railroad surveys. The field cost of these surveys shows an increase of \$3 per mile for the former and a decrease of \$3 per mile for the latter. The office cost per mile shows a slight decrease in the regular survey returns and a small increase in the railroad returns. It is gratifying to note that the surveys of 638 mineral claims (locations) were approved, an increase of almost 65 per cent, the office cost of which decreased 20 per cent, to \$9.48 per location, while the forest homestead surveys shows an increase in approvals of 460 per cent. The office cost of the forest homestead surveys decreased 25 per cent, or to \$9.85. Indian reservation work shows 25 miles of surveys approved, and miscellaneous surveys embraced 20 miles of small holding claims. With the completion of the fragmentary surveys in groups 92 and 93, now in process of execution, the survey of all the surveyable non-Indian lands within the primary limits of the grant

to the Atlantic & Pacific Railroad Co. in Arizona will have been completed. The survey of the railroad lands within the Hualpai Indian Reservation is now in progress.

COLORADO.

The surveyor general reports that his office approved returns of resurveys amounting to 2,158 miles, at a field cost of \$30.58 per mile and office cost of \$5.27 per mile. This is a reduction in mileage of 300 miles, due to the difficulty of procuring sufficient force of competent surveyors. The cost has increased about \$5 per mile in the field and \$2 in the office, which is accounted for by the increase of cost of equipment and subsistence. Forty-three mineral surveys were approved and 133 locations, which is a decrease of 15 surveys and 38 locations; the average cost of office work on locations was \$23.29, which is an increase of \$5.50 on last year. The record shows an approval of 54 surveys of forest homesteads, an increase of 20 and a reduction of 10 per cent in office cost. The surveyors in this district have made examinations for obliteration in 24 townships, and during the year the returns of surveys of two town sites were disposed of. The money received from copies (\$1,315.75) doubles that of the previous year. Fifty-six supplemental plats were prepared. There has been an unusual amount of miscellaneous office work, including a very heavy correspondence, hundreds of miscellaneous tracings, diagrams, and blue prints, mounting of plats, indexing of records, etc. An apportionment to this district of \$60,000 in 1921 is needed to provide for work already authorized. A change in practice of dealing with mining-claim surveys is recommended, believing that the actual cost keeping has demonstrated that the system of requiring applicants to deposit the cost of office work discourages the applicant for a single mining-claim survey and favors the applicant for a "group" survey. Legislation is recommended authorizing flat fees, to be deemed fully earned upon completion of the work.

WASHINGTON.

The surveyor general submits a statement of mileage of surveys the returns of which were approved, embracing 15.71 miles of railroad grant surveys at a field cost of \$73.24 per mile and office cost of \$13.02 per mile. Public-land surveys approved amounted to 725.94 miles at a field cost of \$61.70 per mile and office cost of \$3.71 per mile. This is an increase of public-land surveys over last year of 100 per cent, and a slight decrease in the cost. The extraordinary cost of the surveys produced in 1919 and 1920 is due to the exceptionally difficult character of the country traversed which is the wildest and roughest portion of the Olympic Mountains, the surveys being required for

the exchange of State lands. Six mineral surveys were approved, and 25 mining locations at an office cost of \$14.06 per location which is a decrease in cost of \$3.76 each over 1919. The activity in forest homestead survey work is represented by six surveys and four special instructions approved at a cost of \$6.65 each, which is about half the cost reported last year. The sum received by him for copies of records is \$707.60.

SOUTH DAKOTA.

This office is mainly occupied with returns of surveys in the Black Hills region. During the year 1920 no returns of rectangular surveys of public lands were approved. Of mineral surveys there were approved two surveys and three locations, the average office cost of each location is \$32.51, which is an increase of \$13.10 each. Surveys of forest homesteads have been disposed of amounting to 55, and 17 special instructions, the office cost was \$7.50, the same as last year.

OREGON.

The approved surveys show 1,162.96 miles at an average cost of \$57.69 per mile for field and office work. Compared with the report of 1919 this is an increase of 873 miles and a 12 per cent increase in field cost. This cost is doubtless due in part to the completion of the surveys of the Oregon and California grant, and the mountainous character of the lands. The returns of forest homesteads surveys examined and approved by him were 21 in number with an average cost of \$8.12, which is about the same as that of 1919. He recommends that the sum of \$30,000 be set apart for surveying the public lands in 1922.

CALIFORNIA.

The approval is reported of the surveys of 591.32 miles of railroad grant lands, 1,319.17 miles of public-land surveys and 187.75 miles of miscellaneous surveys accomplished during the year. The average cost of field and office work per mile is \$21.92 for the grant surveys and \$30.17 for the public-land surveys. The output of all surveys is slightly less than that of 1919 and the cost per mile is about 50 per cent greater. There was also a falling off in the aggregate of mineral surveys in 1920; 35 surveys and 95 locations were approved as against 55 surveys and 196 locations in 1919. The office cost on these was about 10 per cent higher in 1920. The office received for copies of records \$1,892.15. The cost of field work on resurveys during the last year was \$20,508, and for both surveys and resurveys, the amounts expended for the last four years have been respectively \$34,500, \$40,000, \$44,000, and \$49,500, showing a constant progression. The amount necessary to complete all the surveys within the primary and overlapping grants to railroad companies

is estimated to be \$58,000. A special appropriation of \$65,000 is recommended to be obtained of Congress for retracing the oblique boundary line between California and Nevada and making the proper closing of the present public-land survey lines thereon. The completion of the resurvey of the international boundary between California and Mexico is recommended, involving the segregation of the 60 foot strip parallel thereto. The cost of this work is estimated at \$20,000.

UTAH.

The surveyor general reports having approved the returns of surveys of 1,401.25 miles of lines established and gives the field cost per mile at \$25.57 and office cost \$2.11 per mile. The figures show a reduction of 200 miles from last year, but the field cost is decreased 10 per cent and the office cost 50 per cent. The mineral surveys approved by him show a small increase in surveys and locations and a decrease in office cost. The activity in this branch of work is indicated by the receipt during the year of returns of 538 surveys of mining claims and 2,574 locations, and, of these, 483 surveys and 2,294 locations were returned for corrections. Forest homestead surveys were approved amounting to 26 at an office cost of \$6.58 each, a decrease of \$1.50 each from that of 1919. The sum of \$849 was received for copies of records. Touching upon the subject of an increase of apportionment to Utah to \$100,000 for the season of 1922, the report states that the urgent requests of the citizens and the State warrant this recommendation; that although the 19,000,000 acres of unsurveyed land in Utah have been considered, in the past, unfit for agricultural purposes, much of it is now conceded to be adapted for dry farming and grazing purposes.

IDAHO.

During the last year the record shows the approval of the returns of surveys of 862.75 miles run and established at an average cost including office work of \$20.52 per mile, which is considerably less than last year, the average being \$26.73 for 1919. The mileage output, however, is very much less this year than last. The mineral surveys for 1920 show an increase of 100 per cent. The returns of 50 forest homestead surveys were examined and passed, with 15 special instructions therefor, at an expense of \$7.49 each, which is a reduction over last year of 30 per cent. The receipts from copies of records amounted to \$1,062.10. The sum of \$65,000 is recommended for the field surveying service in 1922. The amount represents the expense of surveying 40 townships on applications from settlers at \$1,500 per township and \$5,000 for miscellaneous surveys and examinations.

NEVADA.

The total mileage of surveys established in 1920, the returns of which were approved, is reported as 821, a reduction from that of 1919 amounting to 50 per cent. The cost including office work averaged \$31.40 per mile, which is an increase of 25 per cent over last year. Fifty-four mineral surveys and 230 locations were approved—an increase of 70 per cent over last year, the office cost per location being \$13.61, a reduction of cost over last year of 30 per cent. Forest homesteads were approved to the amount of 15 cases, a reduction of 25 cases, but the office cost was reduced 13 per cent. Receipts for copies of records amounted to \$837.05. For surveys in 1922, \$45,000 is recommended. A constantly growing demand exists for lands under the stock-raising homestead law, and the Pittman Act, for the reclamation of arid lands by the development of an underground water supply. The closing of townships on the oblique west boundary of the State as established by the United States Coast and Geodetic Survey is a matter that should receive attention. The surveys of lands under the second preference should also be given consideration, as well as the possibilities of great areas of unsurveyed lands which may prove, with development under way at the present time, to be oil bearing.

WYOMING.

The surveyor general has approved the returns of surveys and resurveys in Wyoming amounting to 1,254.75 miles, a decrease of 40 per cent from 1919. The production was less because of the small number of surveyors available. The field cost was increased about 25 per cent, and, due to the advance of prices in all lines, the office cost averaged \$3.04 per mile, an advance of about 25 per cent over last year. Fifteen mineral surveys and 49 locations were approved at an average office cost per location of \$11.57. Forest homestead surveys were disposed of at an average of \$8 per survey, an increase of 50 cents each. The sum of \$40,000 is recommended as the apportionment for 1922.

NEW MEXICO.

The approval is reported of the returns of 1,660 miles of surveyed lines of public lands, and 801 miles of Indian reservations. This is a decrease of public-land surveys and an increase of reservation lines. The average cost per mile is \$33.88, which is about double that of 1919. The mineral surveys and locations have increased fivefold, at an increased office cost per location of 40 per cent. The surveys numbered 28 and locations 69. Forest homesteads were approved at an office cost of \$3.07, which includes the expense of approval of 19 special instructions. Receipts from copies of records amounted to \$207.85. The sum of \$57,000 is recommended for 1922.

NEBRASKA—SOUTH DAKOTA.

The assistant supervisor of surveys, who is conducting resurveys, reports a mileage of 600, which is a falling off from the previous year owing to the fact that the resurveys have been unusually complicated. The surveyors were also handicapped by a lack of competent experienced assistants, and a loss of men through the inability of the surveyors to equal the higher wages being offered by others. The field and office cost average about the same as last year. In the Black Hills, South Dakota, there was but little work executed and only one crew was engaged, the character of the country surveyed was very rough, and but a part of one township was surveyed. The sum of \$30,000 is recommended for 1922.

MONTANA.

The returns of surveys disposed of (representing lines of surveys established in 1920) are reported as 292 miles of railroad-grant surveys and 1,360 public-land survey lines, a decrease from 1919 of 2,531 miles. The field cost per mile was, in the case of railroad surveys, diminished 7 per cent and the office cost about 50 per cent per mile. The field cost of public-land surveys was increased 60 per cent per mile and office cost of the same increased about 35 per cent. The increased cost of field work was due not only to the general advance in the price of subsistence, transportation, and equipment, but to the fact that the lands, applications for the survey of which are now received, are more and more mountainous each year, the survey of the lowlands being now nearly completed. The above does not include the survey of Indian lands. The record shows that returns of 935 miles of reservation lines were disposed of, an increase of 627 miles over last year. The field cost per mile was \$15.63 and office cost \$1.29, which is considerably less than that of public-land and railroad survey, mostly owing to the difference in the character of the land surface. In mining surveys the record shows the approval of 49 surveys and 92 locations, a decrease of about 30 per cent. The office cost per location is \$18.53, a decrease of \$1.67 each. There were approved 71 forest homestead surveys and 66 special instructions therefor, a decrease of 10 per cent in surveys and an increase of 100 per cent in special instructions. The average cost of office work on each is \$7.69, as against \$9.06 in 1919. The sum of \$65,000 is considered as needed for the cost of surveys to be executed in 1922.

SUMMARY.

The acreage of public-land surveys approved this year was considerably less than the average acreage approved during the last five years. The amount of survey work in the field was a good deal

less on account of the high cost of operation, but until last year there have been arrearages in all of the offices and this accumulation furnished sufficient work for the forces. The natural tendency was, of course, to approve the easier surveys first, allowing the knotty problems to remain until the end. This is evidenced by the fact that nearly all of the townships that were approved this last year were fragmentary, the average acreage per township being about 12,000 acres. Public land surveys are becoming more complicated each year, and without doubt the expense will greatly increase if conditions remain the same. Last year there were 669 townships approved, covering 11,027,826.37 acres, at an average cost of \$0.073 per acre. This year there were approved 403 townships, covering 4,848,554.57 acres, at an average cost of \$0.131 per acre.

MINERAL SURVEYS.

The showing in the mineral work is very gratifying. The report indicates that this year there were approved 477 surveys, embracing 1,875 lodes, at an average cost of \$13.92 per lode. Last year 401 surveys were approved, covering 1,488 locations, at an average cost of \$16.22 per location. There was a considerable reduction in the cost this year—in fact, this is the lowest cost we have succeeded in obtaining, notwithstanding the fact that for the past two years \$4.10 for photolithographing the plats of each survey was paid, whereas the charge in previous years was but \$3.25.

FOREST HOMESTEAD ENTRY SURVEYS.

There is also noted an increase in the number of homestead entry surveys approved this year. During the fiscal year 1919, the surveyors general approved 415 surveys, at an average cost of \$9.44, while this year there were approved 445 surveys, at an average cost of \$8.07.

IN GENERAL.

Besides the work above enumerated there were prepared in the offices 989 supplemental and segregation plats, as against 599 plats prepared last year. This work occupied much of the time of the draftsmen, as in many instances the plats were very complicated and were made special, at the expense of the regular work. There was also earned \$8,722.78 for copies of records, as against \$6,065.78 last year.

The most gratifying feature of the report this year is that it shows that the work in the offices is current. There are pending in all of the offices at this date only 338 townships, 86 mineral surveys, 96 forest homesteads, 2,427.4 miles of Indian work, and 21 townships and 181.27 miles of miscellaneous surveys. Of this last item the 21

townships cover examination for obliteration. When we review conditions as they existed three years ago we find that in the State of Arizona alone there were 356 townships pending office examination, or more than the total number now pending in all of the States.

BUSINESS ADMINISTRATION.

That these offices are now operated on a strictly business basis is evidenced by the fact that this year there was not available the \$25,000 of the surveying fund which has been allotted for office work for several years past, and there was returned to the Treasury in the neighborhood of \$25,000 of the appropriation for salaries, showing that as the work decreased along some lines our funds were not wasted by keeping a big force on the pay roll simply for the purpose of spending the appropriation and allowing the clerks to remain idle.

The elimination of the arrearages that were so vexatious a few years ago was accomplished by the introduction of business methods and equipment, thus reducing the cost, expediting the work, and increasing the salaries of the clerks on an average of \$197.21 each over the amount paid five years ago, and at the same time effecting a saving of \$50,000. The clerical force has been reduced from 173 to 110 clerks during the past five years and to the extent of 5 clerks during the past year. In the table of statistics at page — will be found a tabulated statement showing the output of work in the offices of the United States surveyors general during the fiscal years 1915 to 1920, inclusive.

The provision in the appropriation bill allowing the commissioner to detail clerks from one office to another has operated very successfully and has probably increased the efficiency in the offices as much as any one feature. By the authority thus conferred it was possible to keep the various forces balanced with the amount of work on hand, and when one office is in need of a specially qualified technical clerk for some particular line of work, selection can be made from the various offices of one who exactly fills the bill and detail him into the office until the work is completed.

OKLAHOMA AND TEXAS BOUNDARY.

In the annual report for 1919 comment was made on questions growing out of the uncertainty as to the true location of the boundary between Oklahoma and Texas along Red River. The discovery of oil within the river flood plain has precipitated a very complex dispute relative to the ownership of the river bed.

A suit in equity, original No. 27, was filed in the Supreme Court of the United States in the October term, 1919, by the State of Okla-

homa, complainant, *v.* the State of Texas, defendant. The question at issue involves the construction of the treaty of 1819 between the United States and Spain, as to whether the boundary follows the line of the south bank of Red River or the middle thread of the main channel. In either case great uncertainty arises as to the position of the river in 1819. In March, 1920, the Department of Justice filed a motion to intervene in the suit in order to conserve the rights of the United States to possible public domain and to protect the rights of the Government's Indian wards within the river basin.

On April 1, 1920, the Supreme Court granted the motion of the United States to intervene and enjoined the State of Texas from selling any purported rights covering any lands or part of the river bed lying north of the line of the south bank as it existed at the date of the ratification of the treaty of 1819. The court appointed a receiver to take over the operation of the oil field situated in ranges 11 to 16 west, inclusive, and between the south bank and middle thread of the main channel of the river.

Subsequently suit was filed in the United States Federal Court for the Western District of Oklahoma by the Department of Justice in behalf of the Indian allottees in order to protect riparian claims situated in front of the Indian allotments on the north bank and extending to the medial line between the river banks, which is called for as the south boundary of the Kiowa and Comanche Reservation, according to the Indian treaty of 1867. The district court has appointed a receiver to take over the operation of the oil field within the riparian claims of the Indians. For purposes of accounting, a working agreement has been entered into whereby the receiver for the Supreme Court has control of any areas in conflict between the two receiverships. Pending the trial of the suit the General Land Office is suspending action upon applications for oil leases of public domain within the bed of Red River.

The field surveying service is making extensive topographic and cadastral surveys within the active part of the oil field in Tps. 4 and 5 S., R. 14 W., Indian meridian, and the necessary maps for use at the trial of the suit are being made in the General Land Office. Certain questions of law are set down for hearing in the Supreme Court on November 15, 1920, after which separate consideration will be given to the questions of fact as to the position of the true boundary at definite date.

MAP COMPILING AND DRAFTING.

The increase in cost of labor and materials will permit of the production of only 5,400 copies of the 1921 edition of the United States map, as against 8,900 copies for the 1920 edition, or 21,080 copies for

the 1913 edition; while the number which can be printed under the annual appropriation of \$20,000 has been diminished, the demand for the map is increasing.

Maps of the public-land States in course of compilation, revision, and printing are as follows: Arizona, Colorado, Idaho, New Mexico, Oregon, Utah, and Washington.

There were 17,844 photolithographic copies of township plats sold and 2,580 copies disposed of to this and other departments for official use.

In accordance with act of Congress approved June 5, 1920, the price of photolithographic copies of township plats has been increased from \$0.25 to \$0.50 per copy, effective July 1, 1920.

The following important compiling and drafting has been disposed of during the year:

Preparation of map of Alaskan Railway, showing construction and all homestead and other claims adjacent to railroad; map of the proposed Lassen Peak Volcanic Park, in California, showing status of land; maps of Hawaii and Alaska for reproduction to accompany governors' reports for Secretary.

Preparing exhibit for American Mining Congress at St. Louis, and detail of chief of division to install exhibit and care for same.

Preparation of map of the Oregon & California Railway, showing numbered tracts to correspond with printed schedule for use at sale of lands; also map of Cheyenne and Standing Rock Indian Reservation, for same purpose.

Compilation and drawing of various maps and diagrams from General Land Office engineers' field surveys and sketches, to determine the true boundary between Oklahoma and Texas and establish jurisdiction over certain oil-bearing fields.

TRACT-BOOK NOTATIONS.

The total number of tract-book notations for the present year was 396,324, as compared to 376,151 during the previous year.

This total includes 52,024 appeals and other miscellaneous cases, petitions to designate under the acts of February 19, 1909, and December 29, 1916, 1,351 Indian allotments, 41,693 final certificates, and 50,792 original entries. The number of plats posted was 1,898. During the year 1919, 719 Indian allotments and 1,037 plats were posted.

PRELIMINARY EXAMINATIONS.

Of homesteads, desert entries, timber and stone applications, etc., 51,576 were given a preliminary examination as to their legality and validity, of which 44,310 were passed and 7,266 held for further

action on account of conflicts and for defects of various kinds. This preliminary examination has proven to be most valuable to claimants, in that a large number of the cases held for further action were fatally defective. In such cases the claimants were advised of the defect at the earliest possible moment, and saved the expense of moving upon and improving land to which they could not obtain title. The number of such cases examined in 1919 was 32,193, of which 24,498 were passed and 7,695 held for further action.

WITHDRAWN APPLICATIONS.

The number of homestead, timber and stone, and isolated tract applications closed on withdrawal was 6,135. These were mostly applications under the enlarged-homestead acts. The number of such cases withdrawn last year was 6,756.

SUPPLEMENTAL PATENTS.

Supplemental patents under the act of April 14, 1914 (38 Stat. 335), were issued in 183 cases, all that were found by examination of the tract books to be subject to the act of April 14, 1914. In 1919, 1,898 such patents were issued. The provisions of this act require a supplemental patent when the original patent contained a reservation of coal to the United States, but the land was afterward classified as noncoal.

WITHDRAWALS AND CLASSIFICATIONS.

There were noted the withdrawals of the various tracts included in 1,650 letters and Executive orders, involving withdrawals for stock driveways, national forests, power-site reserves, classifications, reclamation projects, petroleum reserves, designations under the acts of February 19, 1909, and December 29, 1916, and various restored lists. In 1919 about 1,000 such letters were noted. While the number of letters noted was about 65 per cent greater than last year, the number of acres involved was about 1,200 per cent greater, as under the stock-raising act 68,000,000 acres, in round numbers, were designated, as against about 5,800,000 during the previous year.

CANCELLATIONS AND RELINQUISHMENTS.

Entries to the number of 2,314 were canceled during the year for failure to make proof within the statutory period after due notice. Entries to the number of 25,509 were canceled on relinquishment, as against 14,650 last year. This large number of relinquishments is indicative of the extent of "trading" in unperfected homestead entries.

HOMESTEAD AND KINDRED ENTRIES.

NEW BUSINESS.

During the fiscal year the division that handles this class of work received new cases to the extent of 86,684 (as against 57,005 cases the previous year), consisting of the following:

Final proof certificates: All forms of homesteads (except reclamation homesteads), isolated tracts, timber, and stone.....	42,888
Applications for second homestead entries.....	5,452
Applications to amend entries.....	2,609
Applications for isolated tracts.....	5,004
Applications for extensions of time.....	1,983
Applications for leaves of absence.....	5,182
Original homestead entries requiring special adjudication.....	15,803
Appeals from decisions of register and receiver.....	6,845
Miscellaneous.....	918

WORK DONE.

In addition to the 86,684 new cases received during the year, there were pending at the beginning of the year 3,291 cases and also 9,564 cases were relieved from suspension, making a total of 99,539. During the year action was taken as follows:

Final homestead entries.....	40,095
Final commuted homestead entries.....	1,574
Final forest homestead entries.....	2,705
Timber and stone entries.....	533
Isolated tracts and miscellaneous cash entries.....	2,874
Applications for second entry.....	5,670
Applications to amend.....	2,491
Applications for isolated tracts.....	5,144
Applications for extensions of time.....	2,285
Applications for leaves of absence.....	5,181
Miscellaneous petitions to designate.....	998
Original homestead entries requiring special action.....	18,671
Appeals from decisions of local officers.....	4,794
Total.....	93,015

Leaving pending at the end of the year 6,524.

The total number of letters and decisions mailed in connection with this branch of the work was 68,597, as against 58,915 during the previous year.

THE STOCK-RAISING HOMESTEAD.

The stock-raising homestead act went into effect in the last days of 1916, but save for the filing of some 60,000 applications did not get well into operation until 1918, since which time substantial progress has been made. We have now reached the point where the wonder-

ful benefits or dire consequences which were predicted to be the results of this legislation must begin to be apparent. Our records show that up to date more than 36,000 stock-raising homesteads have been allowed; the Geological Survey reports that a total of 82,000 petitions for designation have been received; that 67,000 have been acted on and a total area designated of more than 74,000,000 acres (including, of course, original entries to which additional stock-raising entries have been applied for). This means that in the very near future the allowed entries will be more than doubled; it means that we will have tried out this act to the extent of 30,000,000 or 40,000,000 acres, enough to afford a basis of judgment as to whether this measure is a solution of the grazing-land problem or a calamity. As we have frequently predicted, it will be neither but, on the whole, beneficial. Be this as it may, final proofs will soon be coming in. It has been claimed by many that the operation of the act would be characterized by subterfuge, bad faith, and fraud; admittedly, the act is susceptible of attempt at that sort of thing; obviously, if fraud and bad faith are prevalent among entrymen under this act the time to make such practices unpopular is now; so one of our important duties from now on is to follow up the actual working of the stock-raising homestead law both as to individual cases and general results.

STOCK DRIVEWAYS.

Since my last annual report was submitted, field investigation of the then remaining applications of stockmen and recommendations of the Forest Service for stock-driveway withdrawals under section 10 of the act of December 29, 1916 (39 Stat., 862), has practically been completed, and such applications and recommendations have been disposed of with but few exceptions. Our driveway investigations are now chiefly concerned with a comparatively small percentage of new applications and recommendations, and an increasing number of petitions for modification of existing driveways from individuals or associations, alleging interference with personal interests or prospective local development. The latter class, while not involving large areas, require a much more intensive investigation than the original.

It is difficult to estimate the amount and extent of the work performed by the field service of this office since the spring of 1917 in making these investigations, which have furnished the department with the information upon which the driveway necessities of the range States have been determined, as the area withdrawn forms but a small proportion of that examined. Some idea of the magnitude of

the task may be obtained, however, by the territory covered, which includes almost the entire area of Nevada, Utah, and southern Idaho, large sections of Arizona, Colorado, Montana, New Mexico, Oregon, and Wyoming, and portions of California, South Dakota, and Washington. The reports of such investigations contain a large quantity of valuable data which will be available for future reference, and certain of the reports have been found useful by the Geological Survey in connection with investigations conducted by that bureau.

Based upon field investigation and my recommendations, you have withdrawn under authority of section 10 of the said act of December 29, 1916, during the fiscal year 2,406,815 acres, inclusive of scattered entries or patented tracts, for stock driveway purposes, and released 132,088 acres from such withdrawal. The total gross area included in driveway withdrawals at the close of the fiscal year is 8,898,258 acres and is distributed by States as follows: Arizona, 418,224 acres; California, 20,114 acres; Colorado, 216,462 acres; Idaho, 703,106 acres; Montana, 187,724 acres; Nevada, 3,603,497 acres; New Mexico, 1,138,486 acres; Oregon, 410,101 acres; South Dakota, 18,320 acres; Utah, 1,145,350 acres; Washington, 10,919 acres; and Wyoming, 1,025,955 acres.

SOLDIERS' ADDITIONAL HOMESTEAD RIGHTS.

Contrary to expectations, there was no great falling off in the number of these cases received during the fiscal year just closed, the number of new applications received being 327, as against 369 the previous year. During the year this office finally disposed of 404 cases by final rejection or the issuance of patents, as against 347 cases the previous year.

At the close of the fiscal year ending June 30, 1919, there were pending 468 cases, of which 56 were ready for adjudication by this office. At the close of business June 30, 1920, there were pending 391 cases, of which only 10 were ready for adjudication by this office, the remaining 381 cases awaiting action elsewhere. Of these 381 cases 94 had been allowed by this office and were awaiting the receipt of final certificates from the local officers; 93 were awaiting the filing of further evidence or other action by claimants, determination of conflicting claims to the land involved, or the receipt of data from the Adjutant General, Auditor for the War Department, or the Commissioner of Pensions; 54 were pending before the Secretary on appeal, 101 were awaiting reports of field examination of the land by special agents, mostly in water-hole cases, and 39 were awaiting reports from the Geological Survey. In other words, they were not, for various reasons, ready for final adjudication by this office.

The adjudication of these cases becomes more complex and difficult with the lapse of time. Since the rule of approximation was abolished, effective December 1, 1919, the number of small fractions required as a basis for combination applications has increased. It is no longer possible to take a 40-acre tract with a combination of small fractions, totaling but twenty and a fraction acres. The area of the rights tendered must now equal the area of the tract applied for. However, a great many combination applications are still being filed. Sometimes one application for a 40-acre tract involves from 2 to 12 fractional rights, generally about 6 or 8 rights, and requires as much time in its adjudication as so many individual cases. During the last few years several cases were received based on over 30 rights. Every one of the rights involved requires the withdrawal from the rejected, patented, or pending files of this office of from 1 to 6 connecting cases, wherein other small fractions of the right have been used or attempted to be used. Thus a mere 40-acre application, even though based on fractions of about 4 rights which have been heretofore adjudicated, the simplest sort of a case, requires the handling of about 20 cases.

Applications are still being filed based upon rights which are being asserted for the first time. These cases are particularly difficult to handle, due to the extremely slight probative value of the evidence available at this late date and the persistency of the scrip dealers who have worked up the claims. Many of these claims have to be handled several times, the cases being held for rejection because of insufficient evidence, further evidence then being filed, and perhaps the case again held for rejection because of insufficient evidence, and so on, until at last the scrip dealer becomes convinced that he can do nothing further to prove the existence of the alleged right, which has been partially worked up by him.

Some few cases are still being received based on assignments by administrators and heirs, which assignments were executed prior to the date of the departmental administrative order of February 15, 1917, referred to in my last annual report. It would appear from the tenor of some of the numerous letters of inquiry which are still being addressed to this office that the scrip dealers have not yet given up hope of some day securing the revocation by executive, judicial, or legislative action of this administrative order. If they should eventually succeed in doing so, no doubt this office will then receive an avalanche of claims based on assignments by heirs or administrators. These claims are generally grossly incomplete in the matter of evidence tending to show the identity of the soldier with the entryman of the same name. The soldier and his widow being dead, even clues to third parties who may have knowledge of

the facts alleged are practically unobtainable. It is hoped that these heirship cases are permanently a thing of the past.

During the last few months of the fiscal year quite a number of applications were rejected for the reason that the lands applied for had been included in public water reserves. Necessarily, the scrip has to be returned to the applicant, which throws the scrip back on the market to be treated as basis for another selection.

In my annual report for the fiscal year ending June 30, 1918, I expressed the opinion that:

Doubtless no law ever passed by Congress for the benefit of the soldier has more utterly failed of its purpose nor better laid the foundation for fraud and subversion of the general policy of the public land laws than sections 2306 and 2307, Revised Statutes, as those sections have been finally construed and applied. They are good examples of what should not be repeated.

Each passing year demonstrates more clearly the advisability of the passage of some law limiting the time within which these rights may be exercised. The soldier and his widow receive but an infinitesimal benefit; the dealers get most of the profit. This office understands that so-called soldiers' additional scrip now sells for about three times what it did a few years ago.

The following table shows the number of cases pending at the beginning of each fiscal year, from the fiscal year ending June 30, 1910, to the fiscal year ending June 30, 1920, both inclusive, the number received each year, the number closed, and the number on hand at the end of the fiscal year:

Fiscal year ending June 30.	Cases pending on first day of year.	New cases received.	Cases closed during year.	Cases remaining unclosed on last day of year.
1910.....	1,365	692	653	1,404
1911.....	1,404	740	713	1,431
1912.....	1,431	495	1,150	776
1913.....	776	491	497	770
1914.....	770	522	636	656
1915.....	656	559	838	377
1916.....	377	636	670	443
1917.....	443	674	586	531
1918.....	531	493	578	446
1919.....	446	369	347	468
1920.....	468	327	404	391

PREEMPTION ENTRIES.

The preemption laws allowing entry of 160 acres upon submitting proof of six months' residence, improvement and cultivation, and payment of \$1.25 per acre were repealed by the act of March 3, 1891 (26 Stat. 1095), except as to lands affected by treaties and agreements with Indians. During the past year 138 preemption entries were made, against 69 the preceding year and 128 two years ago.

TOWN-SITE, TOWN-LOT, AND KINDRED ENTRIES.

The demand for town-site and town-lot entries shows a steady increase from year to year.

Thirteen town-site and kindred entries were sold during the last fiscal year, amounting, with the three pending entries at the beginning of the year, to 16, all of which have been approved for patenting.

There were pending at the beginning of the past fiscal year 69 lot entries, and there were received 1,673 lot entries, making a total number of 1,742, of which 1,648 entries have been approved for patenting, which disposed of 2,131 lots, leaving 94 entries pending at the end of the year.

During said fiscal year there have been quite a number of public sales of lots. Most of the lots have been sold on time, payments being made in installments, the first installment being paid on the date of sale. Two thousand three hundred and ninety-eight lots have been disposed of during the year at public sales and preference-right entries for \$150,941.50. These sales do not include any sales of lots in Alaska.

The public sale of lots by town sites during the past year included the following:

Omak, Wash., 172 lots, for \$10,500.

Inchelium, Wash., 82 lots, for \$2,220.

Nespelem, Wash., 16 lots, for \$500.

Desmet, Idaho, 79 lots, for \$796.

Worley, Idaho, 105 lots, for \$1,666.

Plummer, Idaho, 23 lots, for \$2,598.

Browning, Mont., 371 lots, for \$30,108; besides 148 preference-right claims allowed for \$17,710.

Newell, S. Dak., 140 lots, for \$13,930.

Blackfoot, Mont., 61 lots, for \$3,261.

Powell, Mont., 23 lots, for \$6,580.

Hot Springs, N. Mex., 511 lots, for \$16,600; besides \$13,400 from other lots claimed by preference-right claimants.

Fraunie, Wyo., 46 lots, for \$11,250.

Timber Lake, S. Dak., 63 lots, for \$6,973.

ALASKA TOWN SITES.

The town site of Wrangell, Alaska, was finally closed out under section 11, act of March 3, 1891 (26 Stat. 1095), and the new regulations found on page 16 of Alaska Circular No. 491.

The story of this town site illustrates the ineffective character of the former regulations under this act. Pursuant thereto, the trustee was appointed from outside of the land service, and patent for the land embracing the town site was issued to the trustees in 1906. A survey of the town site into lots and blocks was made under the contract system and was so defective that the survey was finally

discarded. The only thing accomplished after five years of delay and the expenditure of \$7,694 was the entry of the town site; besides, there were left unpaid bills amounting to \$3,441.34, which were paid by trustee's successor as indicated below. Under the new regulations, with the chief of field division as trustee, a new survey was made under the direct system, and the tract was closed out in 16 months, with an expenditure of \$6,761.54. This sum includes \$5,098.48, the expense of the new survey. In addition he paid \$2,157.62 due the surveyors and their helpers on the discarded survey, and the sum of \$1,283.72 due the estate of the former trustee.

It may be said in passing that the object lesson given in this case was largely responsible for calling attention to the necessity of revising the Alaska town-site regulations and the adoption of the present procedure.

The Petersburg town site, Alaska, was entered under the new plan; the trustee collected \$9,377.50 and disbursed for expenses \$7,690.15, leaving on hand \$1,687.35, which sum was turned over to the city treasurer of Petersburg.

This service was rendered the people at actual cost, with no charge whatever for the trustee's services, which in Nome town site cost the lot occupants \$14,510, the entire cost being \$30,240.38. The Nome trust was administered under the old plan and embraced an area less than that of Petersburg.

The chief of the Alaskan field division has been appointed trustee for the administration of Graehl town site, Seater, and southeast addition to the town site of Juneau, and also for two additions to the town site of Ketchikan, Alaska. These appointments have recently been made, and the administration thereof is now in progress.

RIGHTS OF WAY.

The general railroad situation is still so uncertain that little not absolutely necessary is being done by way of present construction or preparation for future construction, at least so far as may be inferred from the number of applications for rights of way over public land. Only about half as many applications for railroad rights of way were received this year as the year before.

Irrigation development, on the other hand, appears to be growing steadily.

Over 100 more applications were received in 1920 than in 1919, so that the right of way work as a whole is heavier this year than it was last. Two hundred and thirty-seven applications under all acts (except hydroelectric) were awaiting action on July 1, 1919. During the year 502 were received as against 466 the year before, leaving 247 pending, of which number 134 were awaiting compliance with calls of the office.

FORFEITURE CASES.

The work of clearing the records of rights of way which are subject to forfeiture has been vigorously pushed. Two hundred and thirteen such cases were docketed, as against 185 the previous year, making a total of 418 docketed cases. Of these 58 were canceled and 79 otherwise disposed of, making a total of 137 finally closed, as against 105 the previous year. Fourteen grants were canceled by judicial decree as a result of suits previously recommended by this office. Thirty suits were recommended during the year and have been instituted.

STATE IRRIGATION DISTRICTS.

Up to the present time the act of August 11, 1916 (39 Stat. 506), under which public unpatented lands within an irrigation district may become subject to the lien of the district's taxes, has been of utility chiefly as furnishing a convenient organization of water users under United States Reclamation Service projects. The other applications that have been received are more indicative of hopeful enthusiasm than of engineering judgment. Almost without exception the applications so far filed have not been supported by sufficient data to permit a reasoned decision as to feasibility of the project. This is not considered to be the result so much of a withholding of data as a failure to appreciate all the factors that must be considered in irrigation development. The water supply for such projects requires careful study, and after this has been determined the question of costs is often of controlling importance. A determination of this matter is particularly difficult at the present time, in view of the recent rapid increases in costs of construction on the one hand and in farm values on the other. Whether or not material changes will occur in the ratio between such factors is an economic question of broad scope which this office can not satisfactorily answer, and yet upon the answer to it will hang the feasibility of many projects. This office has not found it practicable to recommend to the department the approval of any irrigation district not depending upon the United States Reclamation Service for water supply. During the year applications aggregating 53,072 acres were received, making the entire area now pending action 184,220 acres.

PRIVATE IRRIGATION PROJECTS.

During the past fiscal year 72 new reports and 16 supplemental reports have been received, as against 61 new and 28 supplemental reports in 1919, as the result of investigations of private irrigation enterprises and State irrigation districts upon which claimants and applicants under the desert-land laws were dependent for their water

supplies, making a total of 1,066 projects reported on since the adoption of the regulations of September 30, 1910 (39 L. D. 253). There were also received from the Director of the Geological Survey 19 reports made in response to request of this office for information bearing upon the question of the feasibility of these projects.

During the year reports on 106 irrigation companies and irrigation districts have been considered and disposed of, as against 92 last year. In 65 cases affecting approximately 300 desert-land entries and applications the conclusions reached were in favor of the recognition of the company or district as a proper and sufficient source of water supply for desert lands, as against 47 cases involving 288 entries in 1919; in 15 cases, affecting about 50 entries and applications, the conclusions were adverse; while 26 cases were closed without any definite conclusions having been reached, it appearing that there were no longer any desert-land entries or applications involved, all having been relinquished or otherwise disposed of. Of the reports considered, there were five, all favorable, which involved projects previously acted upon, the last action being taken for the purpose of revising or supplementing the previous action. These five reports involved about 30 desert-land entries and applications.

This office also considered and temporarily suspended action upon 15 projects pending receipt of a supplemental report from the field service. Action was likewise suspended on 45 projects pending receipt of reports from the Geological Survey called for by this office in accordance with departmental regulations. Three cases were referred to the Director of the Reclamation Service with requests for additional information which it was thought could be supplied by him.

On July 1, 1920, there were 25 reports awaiting action by this office, as against 87 last year. In 3 other cases this office was awaiting the receipt of reports from the Reclamation Service and in 24 cases reports from the Geological Survey, the latter class consisting of cases in which this office had requested information relative to the feasibility of the project under consideration. There were also pending 21 cases in which this office was awaiting the receipt of supplemental reports from the field service.

The latest information received (June, 1920) indicates that, including the class of supplemental work just mentioned, there were pending approximately 100 of these irrigation project cases awaiting investigation or report by the field service, as against 172 last year.

HYDROELECTRIC POWER.

The fact that since the approval of the Federal water-power act on June 10, 1920, over a dozen applications under that act have been filed and have reached this office for notation bears out the state-

ment made in last year's report that many companies were holding back application, which would otherwise have been filed under the act of 1901 or 1911, pending the passage of such water-power legislation. It is also fair to assume that others had been filed in the local offices which have not yet been received in this office.

However, during the past year permits were granted the following-named applicants under the act of February 15, 1909 (31 Stat. 790), to wit:

Montana Power Co., storage reservoir in Montana.
Seltz Power & Manufacturing Co., power project in Oregon.
City of Los Angeles, transmission line in California.
Ophir Hill Consolidated Mining Co., power project in Utah.
Union Pacific Coal Co., transmission line in Wyoming.
Flathead Valley Electric Co., transmission line in Montana.
Liberty Potash Co., transmission line in Montana.
San Diego Consolidated Gas & Electric Co., transmission line in California.
Saw Tooth power project, power project in Alaska.
Cain, J. S., power project in California.

During the same period grants of right of way (easements) for transmission lines were made to the following-named applicants under the act of March 4, 1911 (36 Stat. 1253):

Southern Sierras Power Co. in California.
Pacific Power & Light Co. in Oregon.
International Power Co. in Washington.
Ashton & St. Anthony Power Co. in Idaho.

During the year payments were made as compensation for the use of Interior Department lands under permits and grants for hydro-electric-power development and power transmission lines aggregating \$7,443.30.

The passage of the act of June 10, 1920, known as the Federal water-power act, has also raised the suspension on between 400 and 500 entries and selections, which had theretofore been suspended pending such legislation, and the work of disposing of them in accordance with the proviso to section 24 of said act is already actively in progress.

Section 24 provides that filings and entries heretofore made may proceed to patent, reserving to the United States or its permittees or licensees the right to enter upon said reserved lands and take and use the same for power purposes.

THE FEDERAL WATER-POWER ACT.

A matter undetermined at this time is just what part this office will take under the new Federal power legislation. Under the new act the administration of power privileges affecting public lands and navigable streams is placed in a commission, one of whom is the

Secretary of the Interior. The commission is authorized to call on the personnel and organizations of the various bureaus of the three departments affected for help in the administration of the act. Undoubtedly our office will have to make a record of all power applications and grants, and report status of title of all lands affected. Whether we will be called on for field work, either in the way of surveys or power investigations, we are not yet advised. It will be seen at once that this proposition may develop some interesting questions as to conflicts between power applications or rights and rights asserted under the public-land laws.

CAREY ACT.

The fiscal year ended June 30, 1920, brought to a close the first decade of the present method of administering the Carey Act, and a brief consideration of the operation of the act at different periods appears timely as a test of the benefits of this method. Originally the administration of the act in the General Land Office was in charge of a very competent engineer who made office examination of the irrigation plans submitted, and as a result of the defects thus disclosed rejections of applications for segregation were frequent. After this engineer's abilities had received recognition by appointment to a position of greater responsibility and opportunity, the reports of the State engineers as to the feasibility and practicability of the plans proposed were taken as conclusive, the only examinations in this office being as to matters of form and questions of conflict with other claims under the public-land laws. As a result large areas were segregated under chimerical projects. The extent thereof and the resultant losses to settlers became so great that a change in method of procedure was recognized as imperative. Accordingly the present practice was adopted. Applications for segregation are now first examined in the field by competent irrigation engineers and the field report and all other available data are reviewed in this office.

The annual report for the year ended June 30, 1910, shows that approximately 6,500,000 acres had been included in applications. Of this area approximately 2,500,000 acres were included in applications that had been filed in the preceding year, many of them shortly before the end of the year, so that the area that could have been acted on was practically the difference, or 4,000,000 acres. Of this area less than 800,000 acres had been rejected before segregation and approximately 3,000,000 acres had been segregated. Of this area then segregated, over 950,000 acres have been canceled and large cancellations are in immediate prospect; that is, of the land segregated to the State prior to July 1, 1910, approximately one-third has been abandoned and it is probable that less than one-half will ever be

reclaimed. The mere fact that such large areas of the public domain were thus tied up for varying periods of time is not of great importance, but practically every abandoned project meant the loss of many thousands of dollars. Too often this loss fell most heavily on those who had desired to make their homes on the land and increase the agricultural wealth of the United States. In many cases the entire capital of the intending farmer would be swept away.

The applications received since July 1, 1910, are for approximately 4,000,000 acres of land. The rejections made since July 1, 1910, from such applications and from applications that were pending at that date are approximately 2,700,000 acres. Practically all of this land would have been segregated under the practice immediately preceding with resultant losses to bondholders and intending farmers. The segregations under the new procedure approximate about 1,000,000 acres of land. The cancellations from those segregations total about 330,000 acres, but of this area 239,000 acres were relinquished in order that they might be included in a United States Reclamation Service project, so that the erroneously segregated lands, as shown by cancellations to date, aggregate but about 90,000 acres.

The new method of administration was in its inception bitterly assailed as impeaching the integrity and honesty of the State officials, particularly the State engineers, who had certified in every instance that the project was feasible, and as usurping the functions of the court and interfering with the State administration of water rights. The numerous rejections before segregation that have been made and the cancellation of areas previously segregated demonstrate the necessity of a reexamination in this office. Of course, no attempt has been made to usurp the functions of the courts, but merely to determine what the courts would decide upon a question of conflicting water rights when and if the question were litigated. In every instance the office has insisted that every provision of the State law relative to the administration of water rights should be complied with. This, in order that no rights for the project might be lost through technical errors or through negligence.

The cancellations from existing segregations and rejections from applications for segregation cover such large areas that a new method of restoring lands to entry was considered desirable. Usually the lands restored are not of exceptional value unless they can be irrigated and the fact of restoration is practically conclusive that the lands can not be irrigated. However, the word "opening" appears to have a powerful appeal to the public. Frequently each tract of land restored would be covered by from two to three applications. The enlarged homestead and stock-raising homestead laws also introduced complications, by presenting the question of whether the

lands were subject to designation. Accordingly to enable the applicant speedily to ascertain whether or not his application would be allowed a somewhat elaborate method of restoration has been adopted involving more office work in the cancellation of the segregation than prior to July 1, 1910, was entailed in the making of the segregation. Nevertheless the report of work pending indicates that notwithstanding the additional work both in segregating and in restoring lands, the office administration has been kept up to date. The work sheets indicate applications for segregation with an aggregate area of approximately 600,000 acres of land were awaiting action in this office as opposed to 31,000 acres awaiting action July 1, 1919. However, of the area now pending 450,000 acres are included in one application rejected by the local office for conflict with a prior withdrawal. This case could be readily disposed of by affirmance, but is being held under tacit agreement looking toward some adjustment of the situation. Thus, outside of a mere matter of form the area in applications for segregation awaiting action in this office aggregate but 40,000 acres, which is practically the area shown by last year's report. The other classes of work under the Carey Act are being brought up to date.

Since the passage of the Carey Act approximately 889,000 acres have been patented thereunder. Comparatively small areas have been found to have been patented erroneously and have been reconveyed.

The patented land not reconveyed was reclaimed under the following projects, listed by States:

		Acres.
Colorado:		
The Two Buttes Irrigation & Reservoir Co.....		13, 302. 46
Idaho:		
American Falls Canal.....		50, 498. 16
Canyon Canal Co.....		5, 829. 02
Idaho Irrigation Co.....		117, 077. 24
Marysville Canal.....		5, 852. 50
Portneuf Marsh Valley Irrigation Co.....		11, 354. 15
Pratt Irrigation Co.....		3, 948. 60
Union Falls North Side project.....		168, 482. 07
Twin Falls Oakley project.....		10, 910. 10
Twin Falls South Side project.....		183, 524. 06
Total		<u>556, 075. 90</u>
Montana:		
Big Timber, Sweetgrass.....		7, 829. 84
Boulder River Canals		400. 00
Valler, Mont		34, 708. 92
Yellowstone Valley Ditch.....		13, 223. 54
Total		<u>53, 162. 30</u>

Oregon:		Acres.
Brownell Association.....	-----	240. 00
Central Oregon project.....	-----	49,538. 86
Columbia Southern.....	-----	5,644. 99
Deschutes Reclamation & Irrigation Co.....	-----	1,280. 00
Total.....	-----	<u>56,703. 85</u>
Utah:		
Delta Land & Water Co.....	-----	<u>25,814. 65</u>
Wyoming:		
Big Horn Basin Colonization Co.....	-----	2,584. 05
Big Horn Basin Development Co.....	-----	14,713. 33
Big Horn County Canal Co.....	-----	19,468. 24
Boulder Canal.....	-----	5,936. 16
Cincinnati Canal.....	-----	16,722. 38
Cody Canal, Shoshone Land & Irrigation Co.....	-----	19,948. 64
Eden Irrigation & Land Co.....	-----	19,014. 47
Elk Irrigation Co.....	-----	248. 74
Fisher's Pole Creek Ditch No. 2.....	-----	320. 00
Fitzsimmons Canal.....	-----	160. 00
Hanover Canal.....	-----	8,804. 01
James Lake Canal.....	-----	10,731. 75
North Platte Canal & Col. Co.....	-----	13,384. 94
Paint Rock Canal.....	-----	2,142. 42
Reynolds Ditch & Res.....	-----	320. 00
Roane Canal of Lowell Irrigation Co.....	-----	11,020. 05
Sage Creek Canal.....	-----	784. 43
Sahara Ditch Co.....	-----	3,329. 52
Scott Ditch.....	-----	160. 00
Shell Canal.....	-----	2,385. 78
Wheatland Industrial Co.....	-----	10,643. 35
Total.....	-----	<u>162,822. 26</u>

From the foregoing it appears that while Wyoming leads in the number of successful Carey Act projects, Idaho has by far the greater area of lands reclaimed under the Carey Act, such area, in fact, being greater than the area so reclaimed in all the other States combined. The principal areas in Idaho were reclaimed under three large projects, of which two divert water from the Snake River and one from the Malad River. The largest of these projects contains more land reclaimed under the Carey Act than has been so reclaimed in all the States other than Idaho and Wyoming. It is anticipated that the lands that will be patented in the fiscal year ending June 30, 1920, will exceed 50,000 acres, but will not be sufficient to bring the total area patented under the Carey Act up to the 1,000,000 mark.

DESERT LANDS.

The desert-land section, despite the loss of some of its best adjudicating clerks and the consequent necessity of training new men for the work, has made a remarkably good showing, and in the amount

of business received and disposed of is far and away ahead of last year.

It received during the year 8,625 applications and entries of all descriptions, as against 7,324 last year. It disposed of 8,650 cases, as against 6,521 last year.

It now has pending 7,487 cases, as against 8,907 pending June 30, 1919.

Of the pending cases 6,445 are either under orders of suspension or compliance with calls of the office, leaving 1,042 pending office action.

A comparison of the main classes going to make up the desert-land work follows:

	Received.		Disposed of.		Pending.	
	1919	1920	1919	1920	1919	1920
Desert-land applications.....	628	787	362	614	910	1,083
Original desert-land entries.....	1,723	2,179	1,290	2,661	2,525	2,038
Annual proofs.....	1,237	1,361	1,188	1,483	401	279
Applications for extension of time.....	1,032	772	848	780	1,459	1,451
Final desert-land entries.....	1,548	1,598	1,567	1,828	1,917	1,687
Applications, act Mar. 4, 1915.....	934	665	1,118	1,005	1,041	701
Entries patented.....			1,456	1,765		

Applications to make second entry, assignments, applications to contest, and applications under the act of March 3, 1909, show the same relative increase over last year's work.

The only class of cases in which receipts this year have not been larger than last, are applications for extension of time, and applications under the act of March 4, 1915.

In every class of cases excepting desert-land applications, the total number disposed of has been greater than the number received, and in most cases by a substantial margin.

On the whole, it is doubtful if the desert-land section has ever been in better shape than it is now.

RECLAMATION HOMESTEADS.

This branch of the work during the past year may be briefly reviewed as follows:

Original homestead entries in reclamation projects: Nine hundred and forty-four received, 662 allowed, 76 canceled, and additional evidence called for in 455 cases.

Assignments of reclamation homestead entries: Two hundred and seventy-nine received, 213 approved, and additional evidence required in 50 cases.

Final homestead entries in reclamation projects: Eight hundred and thirty-eight received as against 732 last year and 781 approved

for patenting as against 653 last year; additional evidence was called for in 95 cases.

The cases above enumerated emanate from 15 States, embracing 30 active Government reclamation projects; and the correspondence in connection with this line of work, which presents a wide range of more or less complicated questions for investigation and determination, has been rapidly increasing since the cessation of hostilities in the late war.

During the fiscal year this office promulgated 40 orders of withdrawal under the reclamation act of June 17, 1902 (32 Stat. 388), and 101 orders of restoration. The total area thus withdrawn during the year was 874,705 acres, while the area restored during the same period was 2,178,315 acres.

The more important openings of irrigated lands to public entry during the year were as follows:

Project.	Date of opening.	Acreage.	Number of farm units.	Farm units entered.
Shoshone, Wyo.....	Oct. 9, 1919	5,500	79	70
Newlands, Nev.....	Feb. 26, 1920	1,525	24	24
North Platte, Wyo.....	Mar. 5, 1920	5,078	80	80
Shoshone, Wyo.....	Mar. 13, 1920	5,500	57	57
Grand Valley, Colo.....	Mar. 25, 1920	377	10	5
Newlands, Nev.....	Mar. 31, 1920	1,929	19	10
Milk River, Mont.....	Apr. 30, 1920	1,100	21	21

PUBLIC-LAND SALE.

YUMA AUXILIARY PROJECT.

Under the act of June 25, 1917 (39 Stat. 868), as amended by the act of February 11, 1918 (40 Stat. 437), the Secretary of the Interior is authorized to set apart certain public lands in Arizona as an auxiliary project to the Yuma Reclamation project, and to sell such tracts at public sale. Pursuant to said authority, a public sale of lands within the first mesa unit of such auxiliary project was held at Yuma, Ariz., commencing December 10, 1919. The lands sold were platted to farm units containing from 5 to 20 acres each, but no one person was permitted to purchase more than 40 acres. Five hundred and eighteen of such farm units have been disposed of, the sale price of which was \$171,340.40, value of water right \$1,212,056, and total value of land and water rights \$1,383,396.40.

Four hundred and fifty-two of these applications have been received in this office since the sale, of which number 301 have been examined and accepted, and 151 suspended pending the compliance with certain requirements which it has been found necessary to make.

This opening marks a departure in the disposition of public lands;

it is a new method of procuring funds for the reclamation of arid lands. Financing is always one of the great problems of such enterprises. This project will finance itself; the payment of the purchase price and building charge will meet the cost of construction as fast as the money is needed; when construction is completed the project will be paid for without the Government advancing a dollar. The fact that 5,000 acres of unreclaimed, arid land, with future water rights, were disposed of at an average price of \$230 per acre, is significant of the demand for irrigated lands, and confidence in the ability of the Government to make the lands worth the price. Of course, in this instance, the fact that the lands in question are in the cotton and citrus belt of the Southwest largely explains the high price which purchasers could afford to pay.

STOCK-WATERING RESERVOIRS.

Two hundred and twenty-three reservoir declaratory statements were received or docketed during the past year, which, together with the 196 pending July 1, 1919, made a total of 419 of these claims before the office for action. Of this number, 8 were approved by the department, 84 canceled, and 147 otherwise disposed of, leaving 180 pending June 30, 1920, of which 176 were pending response to calls of the office and but 4 pending office action.

GROUND-WATER RECLAMATION ACT.

The act of October 22, 1919 (41 Stat. 293), commonly known as the Pittman Act, authorizing the Secretary of the Interior to grant permits for the exclusive right to explore for water in a single tract, previously designated as subject to disposition under the act. No limit is placed upon the number of permits that may be granted to a single individual, but within an area of 40 miles square not more than one permit may be issued to the same person. The filing fee is 1 cent an acre. Two years from the date of the permit are allowed in which to complete the work of exploration, and whenever within that period the permittee shall develop and make beneficial use of sufficient water for the irrigation of not less than 20 acres, and shall actually reclaim the same, he will be entitled, under the terms of the act, to a patent for one-fourth of the land described in the permit. The act has application only to lands in the State of Nevada, but its benefits are not denied to citizens of other States, and married women, if their interest is actual and bona fide, have the same privileges as unmarried persons.

Considerable interest is being manifested in this act, as is evidenced by the large number of inquiries which are being received from different sections of the country and the steady flow of applications

being received. Notwithstanding the regulations under the act (Circular 666) were not available for distribution until late in the winter, 152 applications have been received, involving approximately 375,000 acres, and 21 permits have been issued.

An act was introduced in the last Congress making the Pittman Act applicable to California, and although it failed of passage, it is understood that it will be again introduced upon the convening of the next Congress.

CHUCKAWALLA VALLEY.

There are now pending about 800 unperfected desert-land entries involving lands in the Chuckawalla Valley and on the Palo Verde Mesa, in Riverside County, Calif. No effort to reclaim these lands by irrigation, as required by the desert-land law, has so far been successful, and the usual time allowed for that purpose has long since elapsed. On the other hand, the climate is so exceedingly arid that it is doubtful whether or not the entrymen could comply with the provisions of the act of March 4, 1915 (38 Stat. 1138, 1161), commonly known as the relief act.

Three attempts have been made to aid these claimants by legislative enactment of a special character, the last of which was the act of April 11, 1916 (39 Stat. 49). Under authority given by this act, and after a field investigation, the entries were by departmental order dated May 20, 1920, further suspended until May 1, 1922, it being stated in the order that this suspension was granted for the express purpose of enabling the interested parties to make whatever further investigation they might see fit in an endeavor to work out and demonstrate a feasible plan of reclamation. Inasmuch as this is the full measure of indulgence allowed by existing law, it will be necessary upon the termination of the suspension now in force to proceed against the entries with a view to their cancellation in the event compliance with the law can not be shown.

STATE SELECTIONS AND STATE GRANTS.

A further reduction in the acreage of pending State selections is recorded: Receipts, 615,539.60 acres; disposals, 1,547,897.80 acres.

The doubt and uncertainty which had arisen because of conflicting land department and court decisions with respect to the exchange provisions of the act of February 28, 1891 (26 Stat. 796), and which resulted in suspension of action for several years on indemnity school-land selections based on such exchanges, was removed by decision of the United States Supreme Court, March 26, 1917 (243 U. S. 415). The States continued to assert new claims, by selection, during the period of suspension, the result being that on June 30, 1917,

there were nearly 4,500,000 acres of indemnity school-land selections awaiting adjudication. Since that date 2,239,398.40 acres of such selections have been received, and 4,322,833.95 acres have been finally disposed of by conveyance of title to the States or by rejection and cancellation.

There were received during the past fiscal year 587,763.93 acres of indemnity school-land selections and 27,775.67 acres of selections under grants in quantity for specific purposes; total, 615,539.60 acres. During the same period 1,317,009.98 acres of indemnity school lands and 167,751.92 acres of specific quantity grant lands were conveyed to the States. In addition, 58,435.61 acres of indemnity school land and 4,700.29 acres of quantity grant selections were rejected and canceled, the total acreage adjudicated being 1,547,897.80.

There were 48,291.17 acres of land conveyed to the States, with reservations of mineral deposits (coal, oil and gas, phosphate, nitrogen) to the United States, under the provisions of the acts of Congress of March 3, 1909 (35 Stat. 844), June 22, 1910 (36 Stat. 583), and July 17, 1914 (38 Stat. 509), and 35,179.06 acres under cooperative agreements with some of the States, which provide for the exchange of school-section lands within the boundaries of national forests for other lands within such boundaries, the lands selected by the States, upon confirmation of title, being eliminated from the forests. The total amount of land so far conveyed to the States pursuant to these agreements aggregates 238,929.86 acres.

THE STATE OF WASHINGTON SCHOOL-LAND GRANT.

The Supreme Court of the State of Washington, in the case of *State v. Whitney* (120 Pac. Rep. 116, Jan. 4, 1912) held that Congress could not, by subsequent enactment (act of Feb. 28, 1891, 26 Stat. 796) restrict or change the school-land grant made by the State's enabling act of February 22, 1889 (25 Stat. 676). No provision is made in the act of 1889 for selection by the State of lands in lieu of school section lands in place within reservation boundaries, nor for the protection of those who settle in good faith before field survey on lands which when identified by survey are found to be portions of school sections 16 or 36. Such provisions are found in the act of 1891. The decision in the *Whitney* case challenged directly the position taken by the land department that the act of 1891 is a general adjustment act applicable to all States having grants of public lands for school purposes at the date of its passage, and even after the United States Supreme Court (243 U. S. 415) had upheld the departmental construction placed upon that act, officials of the State of Washington were not in position to invoke the provisions thereof for the purpose of adjusting the school-land grant of that

State. So the matter stood until March 24, 1920, when by decision in the case of *Thompson v. Savidge* (188 Pac. Rep. 397) the supreme court of the State in effect overruled its decision in the *Whitney* case. The school-land grant of the State of Washington is now being adjusted in the same manner as are like grants to other public land States and since the date last above mentioned 77,983.80 acres of indemnity school land have been conveyed to that State.

THE STATE OF FLORIDA ADJUSTMENT.

The grant to the State of Florida for school purposes made by act of March 3, 1845 (5 Stat. 788), has been in process of adjustment for many years. All the records and files of the office pertaining to this grant, many of them antedating the Civil War, were examined and checked during the past year by the agent of the State for the selection of school lands and a representative of this office, with findings as follows:

(1) That, due to faulty bookkeeping, badly kept old records, the State had received title to indemnity school lands to which it was not entitled, for the reasons indicated in its selection lists, to the amount of 7,888.25 acres.

(2) That, exclusive of overdrafts, as just above noted, and pending selections, there remained unsatisfied losses to the State's school grant amounting to 4,977.85 acres.

The State, through its agent, made good the overdrafts or excesses in acreage of selected lands by the assignment of an equal acreage of unsatisfied losses to the grant. Further adjudications may now proceed with reasonable assurance on the part of the Land Department and the State that likelihood of error has been reduced to a minimum.

RAILROAD GRANTS AND SELECTIONS.

Railroad and wagon-road selections were received during the year to the amount of 1,710,915.82 acres, as compared with 529,900.03 acres in 1919.

There were certified and patented 527,640.85 acres, as compared with 632,284.40 acres patented in 1919.

The suits mentioned in the report of 1919 instituted by the Central Pacific and Northern Pacific Railway Cos. to test the right of the Government to withdraw from disposition lands within the railway indemnity limits included in pending, unapproved indemnity selections, and the Northern Pacific Railway Co. to determine what constitutes a mineral classification under the act of March 2, 1899 (30 Stat. 993), are still pending in the courts.

RAILROAD SELECTIONS IN NATIONAL FORESTS.

A decision of more than usual importance was rendered on April 8, 1920, in the Circuit Court of Appeals for the Ninth Circuit, in the case of *United States v. Northern Pacific Railway Co.*, involving some 5,000 acres of land within the limits of the Gallatin National Forest, in which the court, among other things, held that the United States could not defeat the company's right of indemnity selection by appropriating the lands for its own purposes, the court holding as follows:

That promise of the Government of indemnity lands in lieu of what might be lost in the place limits was an essential part of the contract between the Government and the Northern Pacific Railroad Co. for the building of the road it did build, the compliance with which contract on its part clearly precludes, in our opinion, the Government from subsequently taking such lands for other purposes of its own.

It is expected that an appeal will be taken from said decision to the Supreme Court of the United States.

NEW ORLEANS PACIFIC RAILWAY LANDS.

With reference to the claims of settlers upon lands patented to the New Orleans Pacific Railway Co. under the grant by act of February 8, 1887 (24 Stat. 391), in which applications were filed for consideration under the terms of the decision of the Supreme Court of the United States in the case of *United States, Josephine Brown, et al. v. New Orleans Pacific Railway Co. et al.* (248 U. S. 507), it may be stated that since the rendition of said decision and up to the close of the fiscal year there were filed in all 165 applications for consideration, of which 1 was subsequently withdrawn, 9 rejected because involved in pending suits against the company and its transferees, hearings were ordered before the local officers in 54 cases, and 101 cases remain pending awaiting action. There was a much larger number of applications filed than was anticipated at the time of my last report, and this, coupled with a large mass of correspondence relating to the claims, has prevented as rapid consideration thereof as was expected.

SETTLERS ON RAILROAD LANDS IN MONTANA.

Practically all of the claims of settlers on railroad lands in Montana who filed applications for the consideration under the provisions of the act of February 28, 1919 (40 Stat. 1204), have been adjusted and closed.

In all there were 74 claims presented, of which 3 were rejected as not coming within the terms of the act. The company executed relin-

quishments in 47 cases, embraced in 14 lists, covering 13,905.38 acres. It refused to relinquish in 24 cases, involving 7,040.71 acres, mainly for the reason that it did not consider the claims meritorious and that the improvements placed on the land were not of a sufficiently substantial character to indicate good faith in the applicants.

THE DALLES MILITARY-ROAD ADJUSTMENT.

Departmental decision, dated January 24, 1917 (45 L. D. 613), adjusting the grant made to the State of Oregon by the act of February 25, 1867 (14 Stat. 409), to aid in the construction of The Dalles military road, fixed 36,066.55 acres as the amount which the beneficiary company was still entitled to receive to make up the quantity granted. At the time of my last report there had been approved to the company on June 16, 1919, 16,972.73 acres within the primary limits upon which patent had not be issued. Patent was issued to the company on July 24, 1919.

There were also pending a year ago 9,297.15 acres, as to which the Geological Survey recommended a field examination. Since that time the company has also filed the remaining selections required to make up the quantity to which it was held to be entitled, these selections being filed under departmental order dated April 30, 1919, requiring the filing thereof on or prior to July 31, 1919. Sufficient additional selections have been filed to permit elimination of lands found to be mineral in character and otherwise excepted from the operation of the grant, so that the company may receive in full the quantity to which it is entitled. The field examination recommended has not been completed; consequently no further lands have been patented to make up the quantity to which the company is entitled.

COOS BAY WAGON-ROAD LANDS.

The title to the lands granted to the State of Oregon by the act of March 3, 1869 (15 Stat. 340), commonly known and referred to as the Coos Bay wagon-road lands, was revested in the United States under the provisions of the act of February 26, 1919 (40 Stat. 1197), and title thereto reconveyed to the United States by the Southern Oregon Co., as successor in interest under said grant, by deed dated February 27, 1919, executed in accordance with the provisions of the last-named act.

The lands reconveyed, aggregating about 93,000 acres, were examined in the field during the past year for the purpose of determining their character as agricultural or timber lands. The Director of the Geological Survey, under date of April 19, 1920, while not classifying any of the lands as power-site lands, did clear-list as to

power possibilities all lands outside of a certain specified area. The examination in the field is practically completed, and the work of preparing the lands for listing for classification and approval is well in hand.

PAYMENT OF TAXES.

By letter dated January 13, 1920, the Secretary of the Treasury was requested to pay the taxes due on the reconveyed lands, for the years 1909 to 1918, inclusive, as directed by the said act of February 26, 1919, together with the accrued interest and penalties in accordance with the laws of the State of Oregon. The amount due Coos County, Oreg., was \$492,141.68, and the amount due Douglas County, \$55,082.42, a total of \$547,224.10. The question as to whether or not the United States is liable for accrued taxes on two or three tracts remains in abeyance.

EXTENSION OF CIRCULAR OF SEPTEMBER 15, 1917.

Under date of September 26, 1919, the regulations, approved September 15, 1917, relating to the sale of timber on certain isolated tracts of the Oregon & California Railroad lands were extended to the reconveyed Coos Bay wagon-road lands. One sale of timber on a tract of 560 acres was made, including 13,650,000 feet board measure of timber for which \$30,773.92 was received.

PROVISIONS OF ACT OF JUNE 4, 1920.

The act approved June 4, 1920, extends to these Coos Bay wagon-road lands the provisions of the act of May 31, 1918 (40 Stat., 593), authorizing the Secretary of the Interior to exchange for lands in private ownership lands formerly in the Oregon & California Railroad grant and also authorizes a claimant of the preference right of purchase or entry under section 3 of the act of February 26, 1919, to exercise such right of purchase or entry for lands classified and withdrawn as power site lands in the manner provided in section 2 of the act.

CONCLUSION OF SOUTHERN OREGON SUIT.

On May 24, 1920, the chief of field division at Portland, Oreg., forwarded a copy of the decree of the District Court for the District of Oregon, dated April 26, 1920, in the case of the United States *v.* Southern Oregon Co., No. 3701, rendered pursuant to the mandate of the Supreme Court remanding the cause, with authority to modify the decree theretofore entered, so as to carry into effect the terms of said act of February 26, 1919. The court reversed and set aside so much of its former decree as awarded costs to the complainant and accorded to it the right to apply for an accounting as to all moneys

received by the defendant on account of the lands involved. The United States, as complainant, was subrogated to the rights of Harry E. Laughlin, special commissioner, under two contracts entered into by him under order of the court, one for sale of the timber on December 26, 1917, to the Coos Bay Lumber Co. on portions of sec. 33, T. 26 S., R. 12 W., and the other for the sale of the timber November 25, 1918, to the Fyfe-Wilson Lumber Co. on parts of sec. 3, T. 29 S., R. 10 W. Said commissioner was discharged; the First National Bank of Portland, Oreg., as custodian of the funds derived from the sale of the said timber, was ordered to pay said funds to the clerk of the court and deliver to him Liberty loan bonds of the fourth issue of the par value of \$20,000, in which a portion of the funds was invested under order of the court. It was further ordered that the balance remaining to be paid under the contract of the Fyfe-Wilson Lumber Co. should be paid directly to the clerk of the court, to be deposited to the credit of the United States, and the court retained such jurisdiction as might be necessary to enforce the terms of either of said contracts made pursuant to its order. The chief of field division also forwarded copies of letters of the clerk of the court showing that the bank had paid to him \$456.78 as the proceeds of the sale on the Fyfe-Wilson Lumber Co. contract, which he had paid to the Treasurer of the United States for deposit to the Coos Bay wagon-road fund, and \$14,115.67, proceeds of the sale on the Coos Bay Lumber Co. contract, which was also deposited with the treasurer for said fund, and had delivered to him said Liberty loan bonds in the sum of \$20,000, which he also delivered to the Treasury.

OREGON & CALIFORNIA RAILROAD LANDS.

Of the revested Oregon & California Railroad lands reported a year ago as unclassified reports have been received covering the cruises of approximately 100,000 acres. A considerably larger area has probably been cruised and is awaiting the preparation of the necessary reports and approval thereof by the special agent in charge of such classification. The proceedings to determine the mineral or nonmineral character of approximately 55,000 acres referred to in my last report as pending have not been concluded and consequently it has not been determined to what extent the revestment act of June 9, 1916, will apply to these lands. /

UNPAID TAXES.

There remain unpaid taxes on unpatented lands, amounting, including interest and penalties, to about \$50,000. Pending final action as to the mineral character of some of these lands no payment of these taxes will be made.

TIMBER SALES.

Under the circular of regulations approved September 17, 1917, providing for the sale of the timber upon certain isolated tracts of these revested Oregon & California Railroad lands, where it appeared to be to the advantage of the United States to dispose of the same at a fair value, there were 25 sales during the past year, involving the timber upon 3,464.39 acres, amounting to 94,445,000 feet, for which the sum of \$138,519.76 was received.

RESTORATION OF AGRICULTURAL LANDS.

One restoration to entry of lands classified as agricultural was made, as provided by section 5 of the act of June 9, 1916, involving approximately 360,000 acres, situated in the Vancouver, Wash., land district, and the Lakeview, Portland, and Roseburg land districts, Oregon, but mainly in the Roseburg district, south of the line between the Roseburg and Portland land districts, and north of the line of the area restored on March 19, 1918. The restorations were had simultaneously in all the districts. Applicants claiming the preference right of entry were required to file their applications on or after 9 a. m. April 12, and prior to 4.30 p. m. May 8, 1920. During the same period of time soldiers claiming the preference right of entry under the provisions of public joint resolution No. 29, were also permitted to file applications which were treated as filed simultaneously to be disposed of on May 10, 1920. The 60-day preference-right period accorded to soldiers who served in the United States Army by public joint resolution No. 29 extended from May 10 to July 8, 1920. Beginning July 9, 1920, the lands became subject to disposition under the general law.

Up to the close of business June 30, 1920, 50,837.82 acres of these restored lands were entered, of which 120 acres were in the Lakeview district, 412.50 acres in the Vancouver district, 8,156.54 acres in the Portland district, and 42,148.78 acres in the Roseburg district. All of the land restored in the Vancouver district was entered. Including the 300,000 acres in the Roseburg district and 150,000 acres in the Portland district heretofore reported, together with the 360 acres above mentioned, 810,000 acres of these revested lands classified as agricultural have been restored to entry.

EXCHANGE OF TIMBER LANDS.

Under the regulations approved July 17, 1918, under the act of May 31, 1918 (40 Stat. 593), authorizing the Secretary of the Interior in the administration of said act of June 9, 1916, to exchange for lands in private ownership lands formerly embraced in said

Oregon and California grant, as therein provided 17 applications for exchange were denied during the past year, one of which is pending before you on appeal. Eleven cases are pending, awaiting further action, two of which have been published under the regulations, and one application for exchange has been submitted for approval preliminary to the final consummation of the exchange.

PUBLIC SALE OF ISOLATED AND FRACTIONAL TRACTS.

By the act of May 25, 1920 (Public No. 220, 66th Cong.), the Secretary of the Interior was authorized to dispose of at public sale certain isolated and fractional tracts of these revested lands for not less than \$2.50 per acre and the appraised value of the timber thereon, where such lands shall have been subject to homestead entry, for a period of two years. Regulations under this act were approved July 7, 1920.

SALE OF TIMBER ON POWER-SITE LANDS, ETC.

The act approved June 4, 1920 (Public No. 241, 66th Cong.), entitled "An act regulating the disposition of lands formerly embraced in the grants to the Oregon & California Railroad Co. and Coos Bay Wagon Road Co.," authorizes the sale of timber on lands classified and withdrawn as power-site lands, provides for the exercise of the preference right of entry under section 5 of the act of June 9, 1916, or the preferred right of entry or purchase under section 3 of the act of February 26, 1919, on power-site lands, authorizes the exchange of Coos Bay lands for lands in private ownership and requires applicants for exchange to pay filing fees. The circular of regulations under this act was approved June 22, 1920.

MYRTLE POINT LANDS.

On June 28, 1920, regulations were approved under the act of May 25, 1920 (Public No. 218, 66th Cong.), authorizing the purchase by the city of Myrtle Point, Oreg., under the conditions named in said act, of certain described lands, formerly embraced in the grants to the Oregon & California Railroad Co. and revested in the United States, by said act of June 9, 1916.

SWAMP AND OVERFLOWED LANDS.

A grant of swamp and overflowed lands was made by the acts of Congress approved March 2, 1849 (9 Stat. 352), September 28, 1850 (9 Stat. 519), and March 12, 1860 (12 Stat. 3), to the States of Alabama, Arkansas, California, Florida, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, Mississippi, Missouri, Ohio, Oregon, and Wisconsin. That grant gave to those States all the unappropriated

public lands of that character which were within their respective boundaries. Under the grant, the fee simple to 63,920,405.21 acres has been conveyed by approval of swamp-land lists or by patents.

Almost all pending cases are old claims, remnants of an enormous grant, the adjudication of which has been, for one reason or another, unavoidably delayed. Applications for the official identification of only 2,871.10 acres were filed during the past year. During the same period, the swamp-land claim to 29,996.04 acres was finally rejected and to 13,710.38 acres was formally approved by the Department. Patents issued as follows: To Arkansas for 40 acres, to California for 11,514.94 acres, to Louisiana for 2,101.24 acres, to Michigan for 6.57 acres, and to Mississippi for 47.63 acres.

The suit of the United States *v.* Riviera Realty Co. to quiet title to the E. $\frac{1}{2}$ sec. 24, T. 6 S., R. 6 W., St. Stephens meridian, Mississippi, which will result in a construction of the so-called McLaurin Act of March 3, 1905 (33 Stat. 1258), and which was mentioned in my report of last year, has not yet been decided. The lands are occupied by homestead entrymen and are claimed adversely to them through sale made by the State under claim of right to the lands by virtue of the swamp-land grant. That purchase, so the company contends, was validated by the said act.

PRIVATE LAND CLAIMS.

Many inquiries are being received concerning the status of lands segregated on the plats of survey as private land claims. The examination of this class of claims involves considerable concentration, labor, and patience owing to the age of the claims, which are based on rights acquired prior to the acquisition of the lands by the United States, and the great mass of laws under which they are adjudicated. Many questions of interest have arisen during the past year, particularly concerning claims in the State of Louisiana. Great activity relative to lands in this State is being manifested because of the oil possibilities in the State. Upon attempted transfers of real estate, numerous defects in titles are constantly uncovered by local attorneys who appeal to this office for assistance in completing the chains of title in behalf of their clients. The records of the General Land Office are of great value in this particular.

A case in point involves the title to sec. 28, T. 12 N., R. 11 W., Louisiana, containing 640 acres. The land lies within what was known as the neutral territory, between the Rio Hondo and the Sabine River. This territory was claimed by the United States as a part of the Louisiana purchase of 1803, but the Spanish officers continued to exercise jurisdiction therein, until the treaty of February 22, 1819, by which all rights of Spain were ceded. Said section 28 is

included within the boundaries of the private land claim of Pierre Dolet. This claim was, in 1884, confirmed by the Supreme Court of the United States, exclusive of the land within said boundaries which had been theretofore reserved or otherwise disposed of by the United States. The unappropriated, unreserved lands within said boundaries as surveyed and located in 1884, were in the same year patented to the private land claimants under said Supreme Court decision, and surveyor general's certificates, or scrip, were issued to the claimants under said grant for the difference in area between the land patented and the number of acres included in the confirmation. Said section 28 appears to have been excluded from the patent mentioned, and scrip issued in lieu thereof, in the belief that it had been previously disposed of by the United States. Plats of the Dolet claim, prepared by local authorities, indicated the issuance of a patent to Antoine Dubois. No United States patent, however, has ever issued for the land. No claim on behalf of Dubois was presented to the commissioners authorized by Congress in 1823 to examine titles to the land in question. The claim was, however, presented to the register and receiver of the district land office under an act of August 3, 1854, by Dubois, who based his claim on habitation and cultivation, and not on written evidence of title from Spain, and the claim was in 1858, reported on favorably by said officers. Several bills were presented to Congress for the confirmation of the claims reported on favorably in 1858, but were not enacted into law. Heirs of Dolet, who allege that they were not parties to the suit in the Supreme Court of the United States, above mentioned, are now applying for patent for the land under the original grant to Pierre Dolet. The same heirs were attempting to get title under the Dubois claim. The land has become very valuable because of oil, gas, and other mineral possibilities, and several applications have been filed for leases of lands in this section under the oil and gas leasing law of February 25, 1920.

Another private land claim having unusual features was that of Antonio Huertas situated in T. 6 S., Rs. 27 and 28 E., and T. 7 S., R. 28 E., T. M., Florida. The claim is founded on a grant of 10,000 acres of land to Don Antonio Huertas by the Spanish Government prior to the acquisition of Florida by the United States. This grant was made for the raising of stock, which condition he complied with. The recognition of such title by the United States was provided for by the treaty between Spain and the United States. The Huertas claim was confirmed to the claimant in 1832 by decree of the Superior Court for the District of East Florida, which was affirmed by the Supreme Court of the United States at its January term, 1834. The issuance of patent was delayed owing to difficulties encountered in the surveys. The plat made in 1818, adopted by the court, was incomplete, and the survey made in 1857 showed the area

of the lands claimed to be 11,991.20 acres, and further revealed conflicts amounting to 1,040.60 acres. The Huertas claimants waived all right, title, and interest in the conflicting tracts, and patent recently issued to them for the lands not in conflict comprising 10,950.60 acres.

It has been stated that there is no one branch of jurisprudence where greater research and extent of legal learning have been displayed than in the discussion and determination by the judicial tribunals of the intricate questions which have arisen in connection with private land claims. The grants and concessions made by former governments have all been equitably adjusted by the United States by the aid of commissions, commissioners, boards, and courts acting under authority conferred by a series of legislative acts running through a period of more than a century.

During the course of such determination many claims have been rejected because of forged or antedated title papers or because the evidence presented did not entitle the claimants to a grant under the laws of the former government, or that the concession had been forfeited or annulled prior to the cession. In cases where actual possession and cultivation of the land claimed could be shown donations have been made and preemption rights granted for such limited areas as Congress has deemed just and proper. No prohibition or penalty has been prescribed by Congress for the continued assertion of title to public land based upon such invalid claims, however.

In many acts Congress has left to the courts the determination of conflicting titles under such claims. No penalty has been imposed upon the sale and assignment of land of which the grantors had never been in possession, and to which they had no valid claim. The correspondence relating to these claims has brought to the attention of the office many instances suggesting that such claims have been used for the purpose of defrauding or imposing upon the public. Among such claims that are being exploited from time to time are the Don Miguel Peralta claim for a tract 50 by 150 miles in area, nearly 5,000,000 acres, in Arizona; the Charles Beales claim for an indefinite area in northeastern New Mexico and the Texas "pan-handle," estimated at 50,000,000 acres; the Don Jose Valliere claim, estimated at 3,000,000 acres, in Arkansas and Missouri on the headwaters of White River. It is impossible in this brief narrative to state the numerous methods devised to make these claims profitable to the exploiters. They have bargained and sold in small tracts, accompanied by what bore a likeness to an abstract of title; or by what purported to be a copy of an opinion by Daniel Webster. They have been placed in the hands of trustees and certificates of shares sold; they have been organized as corporations and stock sold. The invalid documents have been placed on the county records to the

embarrassment of owners under valid patents from the United States, and purchase money and attorneys' fees collected for quitclaim to clear titles rather than resort to litigation. Other claims that are equally invalid, have been used to collect small attorney fees from multitudinous heirs to assist in the further prosecution of a claim that has been considered and rejected at a time when the witnesses and evidence were available.

The provisions of the act of May 18, 1858 (11 Stat. 290), reenacted as sections 2471 and 2473, United States Revised Statutes, prescribing penalties for the false making of any instrument in writing, or the false dating of any evidence of title under Mexican authority, or presenting false and counterfeited evidence of title, is limited "to lands in California." In any revision or amendment of those sections their provisions should be extended to all public lands of the United States and to evidences of title issued by any former Government.

In this connection I desire to call attention to the need of legislation prohibiting the sale and conveyance of public land, or land to which patents have been issued by the United States, by persons asserting title thereto under such false, antedated, or forged evidence of title; or under evidence of title derived from any foreign Government that has been rejected by any officer, commission, or commissioner, board or court, authorized to pass upon such claims and has not been confirmed or recognized as a valid title, where the grantor and his predecessors in title are not in possession of the land and have not been in possession thereof within 20 years prior to the date of the sale, or some such period of limitation; or where the land thus sold and conveyed has been in the actual use and occupation for a like period of those claiming title thereto under a grant, sale, or patent from the United States.

While the United States has undertaken in the several treaties of cession to recognize or confirm all legal and equitable titles acquired under the ceding Government, the Government is not precluded from requiring that the claimants shall submit their evidence of title to examination that the genuine and valid may be separated from the forged and invalid, nor from prescribing penalties and prohibitions against the further prosecution or assertion of title under evidences of title that may be determined to be forged, fraudulent, or invalid and to the prejudice of the United States and its patentees. The State statutes do not become operative until patent has issued, and are not believed to be fully adequate. In some cases neither party is within the jurisdiction of the State in which the land lies, and the only remedy available to the injured party is a suit in a remote jurisdiction to recover the purchase money from an insolvent grantor.

ABANDONED MILITARY RESERVATIONS.

Considerable progress has been made during the past fiscal year in the matter of the disposition of abandoned military reservations. Most of these reservations comprise less than 5,000 acres or were turned over to this department for disposal subsequent to the passage of the act of August 23, 1894 (28 Stat. 491), and are subject to public sale for cash at not less than their appraised price, as provided in the act of July 5, 1884 (23 Stat. 103). In disposing of some of these reservations, the tracts have been offered tentatively by smallest legal subdivisions, and then by a combination of these subdivisions; and it has been found that more money has been realized by combining the tracts into a large unit than by disposing of each tract separately. Residence, improvements, and cultivation are not required in the case of these sales, and as a consequence good prices are realized.

The former military reservation at Bayside (Point Comfort), in the borough of Keansburg, county of Monmouth, N. J., with a frontage on the ocean, was sold on January 17, 1920, under said act. Said reservation embraced 25.09 acres, divided into two lots of 0.61 and 24.48 acres, appraised in all at \$11,203. The lands were most desirably located. Offered separately bids were made for the two lots aggregating \$16,700, but sold together they brought \$39,100, being \$26,897 more than the appraised price.

The military reservation at Batton Island, situated at the mouth of St. Johns River, south of St. Georges Island, Fla., embracing 1,110.49 acres, appraised at \$5,877.94, was offered at public auction at Jacksonville, Fla., on May 10, 1920, under the said act of July 5, 1884, but only 289.34 acres were sold, the consideration being \$509.30, which was but \$2.26 more than the appraised price of the tracts disposed of. There remain unsold for want of bidders 821.15 acres, which will, when conditions warrant, be reoffered for public sale under the act in question. The report of the appraisers indicates that some of the unsold lots contain valuable shell deposits, fair building sites, and valuable frontage on St. Johns River.

The Camp Three Forks Owyhee abandoned military reservation consisted of a post, grazing, wood, and water reserves and embraced 640.78 acres in Oregon and 4,234 acres in Idaho. These areas were reduced, however, by the fact that some of the lands were classified as mineral and are subject to disposal under the mineral laws, and because two of the sections were section 16, title to which under the laws applicable is vested in the State. The remaining lands, 3,689.13 acres in Idaho, were offered for sale at Boise, Idaho, on June 21, 1920, and 354.05 acres in Oregon at Vale, Oreg., on June 25, 1920.

The lands sold for \$20,083.18, nearly \$5 per acre, a flat increase of 50 cents per acre over the appraised price.

Regulations were prepared for the sale at Willcox, Ariz., under said act of July 5, 1884, of lands in the abandoned Fort Grant military reservation, in Graham County, Ariz. A portion of the reservation was withdrawn for the Crook National Forest, and a portion, including the buildings, was selected by the State of Arizona under a special act of Congress. The offering consisted of 8,003.13 acres, appraised at \$16,568.42. The sale was held on July 6, 1920, the land being disposed of in two units, for the total sum of \$16,850.10.

Reservations Nos. 23 and 24, Gig Harbor, Wash., embracing 1,223.64 acres, were opened by regulations of October 19, 1919, to cash entry by persons who were settlers thereon January 1, 1910, not to exceed 20 acres to each settler, the settlers to pay the appraised price, under the act of July 3, 1916 (39 Stat. 342). Provision is made that at the end of one year any lands not applied for will be disposed of at public auction to the highest bidders under the act of July 5, 1884, at not less than the appraised price. So far 1,039.38 acres have been applied for, leaving only 184.26 acres unappropriated.

Another reservation in the same locality, embracing lots 5 and 6 in sec. 5, and lot 1, sec. 8, T. 21 N., R. 2 E., W. M., Washington, containing 87.47 acres, has been surveyed and appraised in the field. Such survey and appraisement have not yet been approved. The land in this reservation is subject to sale to the settlers thereon in tracts of not to exceed 10 acres under the act of March 3, 1919 (40 Stat. 1319).

Vashon Island Reservation, at the Narrows of Puget Sound, Wash., containing 479.40 acres, has been turned over to the Interior Department by Executive order of May 12, 1920, for disposition under the act of July 5, 1884, or as may be otherwise provided by law. No action will be taken looking to the disposition of this reservation pending legislation which has been introduced proposing to grant a preference right of purchase to a certain class of occupants thereon.

Proctors Landing (Fort Beauregard), La., relinquished by Executive order of September 5, 1919, has been surveyed and appraised in the field, though such survey and appraisement have not yet been approved. This reservation was purchased by the Government in 1856 for a consideration of \$10,000, such reservation at that time containing 100 acres. The recent survey thereof shows the area to be 81.64 acres, the balance of the land apparently having been washed away by Lake Borgne. The land appears to have depreciated more in value than in acreage, same being now appraised at \$571.10, in addition to the old brick and stone fort thereon, valued at \$250 for materials therein. The price paid by the Government for this land

appears to have been influenced by the fact that it was located near the town of Proctorsville, which had been established some years before, in 1848, and that the promoters of the town were able to dispose of a good part of the land in the newly established town at rather fancy prices. The town of Proctorsville appears to be now only a memory. This reservation will probably be disposed of during the present fiscal year at public auction under the act of July 5, 1884.

The undisposed of lands in Fort McKinney depot, post and wood and timber reservations, Wyoming, have been reappraised and provision has been made for offering same at public auction under the said act of July 5, 1884, at Buffalo, Wyo., on October 11, 1920. The lands to be sold embrace 2,464.14 acres, appraised at \$18,996.

The undisposed of agricultural lands in Camp Bowie Reservation, Ariz., embracing more than 7,000 acres, have been reappraised with the view of being reoffered at public sale under the act of July 5, 1884. Inquiry is being made as to the possible mineral character of some of the tracts classified as agricultural. It is probable that the land will be reoffered during the coming fiscal year.

The only abandoned military reservation opened to homestead entry during the year was the Date Creek Reservation, Ariz., which was opened by regulations of March 27, 1920, under the act of August 23, 1894 (28 Stat., 491). This reservation embraced 6,370.83 acres, of which 840 acres have heretofore been patented and 1,082.09 acres are within school sections granted to the State, leaving a net area of 4,448.74 acres opened to entry. Settlers are required to pay the appraised price for the land.

Fort Sabine Reservation, Cameron Parish, La., embracing more than 20,000 acres, has been appraised. The Geological Survey has been requested to report whether or not there is oil on these lands, same being in the near vicinity of heavy oil development in Louisiana and Texas. In the event the lands are reported as not containing oil, it is probable that they will be opened to entry during the present fiscal year.

Under the provisions of the act of January 23, 1920, the city of Fort Smith, Ark., has been granted the block or square of ground, comprising about 2 acres, on which is situated the old Federal jail, formerly a part of the Fort Smith Military Reservation. The reservation was bought by the War Department in 1858 for military purpose and was turned over to this department as no longer needed for such purpose in 1871. For a number of years the jail was used for the confinement of United States prisoners. The grounds are to be used for a site for a convention hall, community building, or other public purpose.

INDIAN ALLOTMENTS.

Under the regulations of April 15, 1918, married Indian women were declared not to be entitled to allotments of public land. Over 1,000 allotment applications by married women were subject to rejection under this ruling, and in many cases final action was taken against them.

February 12, 1920, the department set aside this construction of the allotment law and decided that marriage did not prevent an Indian woman from obtaining an allotment of land. She must, however, show some substantial and beneficial form of use or occupancy of the land for a period of two years from becoming entitled to patent, though actual residence is not required. Many of the rejected applications have been reinstated.

The period of two years, during the whole of which time some form of use or occupancy sufficient to indicate that the land was taken in good faith, has expired in a number of cases, and it is expected that affidavits showing what has been done will be received in increasing numbers.

Application for allotment of public lands have been accepted in 1,359 cases during the year, and 459 have been finally rejected.

There were issued to Indians, chiefly under the general allotment act, 1,853 trust patents of a total area of 181,703.545 acres. There were also issued to Indian trust patentees or to persons who had inherited or purchased the land from them 8,185 patents in fee, conveying a total of 1,138,023.081 acres. This is more than twice the number issued in any previous year and evidences the intention of the department to make the Indian, who becomes a citizen after issuance of such a patent, dependent on his own resources for the future.

The work on Indian allotments comprises three classes of cases, viz, (1) tribal Indian allotments, (2) applications for allotments on public domain (fourth section), (3) requests for fee patents on Indian allotments theretofore covered by trust patents. About two-thirds of these requests are in what is known as "sales" cases, wherein the rights of the Indian have been disposed of, and in one-third the request is in behalf of the Indian.

Action on tribal allotments and on fourth-section allotment applications was suspended by departmental order of October 27, 1913, pending the approval of a new set of regulations, and on April 15, 1919, when those regulations were approved, there were on hand awaiting action 4,920 tribal allotments and 6,105 allotment applications; since April 15, 1918, there have been received 2,172 additional tribal allotments and 1,555 allotment applications, making a total of 14,752 for these two classes. These figures include about 3,000 fourth-section allotment applications, filed for Papago Indians on lands in

southern Arizona set apart for them by Executive order of February 1, 1917, the rejection of which applications, subject to appeal, because of the unsuitableness of the land, was ordered by the department on September 18, 1919. The required preliminary action has been taken on all these cases as directed. There have been finally disposed of, of these two classes of cases, 11,261; and of the remainder, 3,491, action has been taken in 3,089, which are now awaiting reports. The disposition of this very large accumulation resulting from five years' suspension of operations on these two classes is a source of much gratification.

Since March 1, 1919, there have been 12,952 requests for status on applications for fee patents on Indian allotments by Indians and transferees. These have all been acted on except 413.

The act of May 17, 1906 (34 Stat. 194), provides that there can be allotted to Alaskan Indians or Eskimos not to exceed 160 acres each. Applications under this act are for unsurveyed lands usually on the shore of some arm of the sea, near good fishing grounds. Proof that the native has taken the land for a permanent home is usually obtained through a representative of the Bureau of Education, which office looks after the interests of the Alaskan natives. After approval by the department and the identification of the land by an official survey, this office issued during the past year the first certificate to an allottee under the act, which declares that the land shall be deemed the homestead of the allottee and his heirs in perpetuity and shall be inalienable and nontaxable until otherwise provided by Congress.

CHIPPEWA LOGGING OPERATIONS, MINNESOTA.

The past year has been a quiet one in logging operations on ceded Chippewa lands in Minnesota. Only 1,239,560 feet were cut under contract, for which \$6,114.86 were received; 546,810 feet were cut in the way of trespass, for which \$6,612.87 were collected; and the contractors paid \$13,098.66 in interest charges for extensions of time within which to complete their contracts. The total amount cut the past year, contracts and trespass, was 1,786,370 feet and the total receipts \$25,826.39, against 1,524,120 feet cut and receipts of \$9,030.62 the previous year.

There have been scaled to date, under contract, 1,280,225,247 feet, for which \$9,055,160.44 have been received, and under trespass 4,886,459 feet, for which \$49,470.69 have been collected. Besides, there has been collected from purchasers, for interest and overhead charges because of extensions of time, the sum of \$88,544.25, making the total amount cut, scaled, and paid for 1,285,111,706 feet of timber and the total receipts \$9,193,175.38. The total expense, including trespass, has been \$404,761.53, or 4.4 per cent of the total receipts.

There are three unfinished contracts, having about 60,000,000 feet yet to cut. This timber will be cut in the next two years.

On December 30, 1919, bids were opened in the local land office at Cass Lake, Minn., for the pine timber on seven 40-acre tracts of ceded Chippewa lands. The Government estimates showed that there were 465,000 feet of white pine and 152,000 feet of Norway pine on the land, only 90 per cent of which was sold, the remaining 10 per cent to be left standing for purposes of reforestation. The J. Neils Lumber Co., of Cass Lake, Minn., was the highest bidder for the timber, its bid being \$18.61 per thousand feet for white pine and \$16.11 per thousand feet for Norway pine, and the bid was accepted. These are the highest prices ever bid for timber on ceded Chippewa Indian lands sold by the Government at a public sale. The total amount of the bid is \$9,372.44.

MINNESOTA DRAINAGE ACT.

A class of entries in which residence, improvements, and cultivation are not required is permissible under the act of May 20, 1908 (35 Stat. 169). The provisions of this act, known as the Volstead or Minnesota drainage law, are restricted to the State of Minnesota. Under said law there have been 1,002 entries approved for patenting the past year, covering an area of approximately 160,320 acres, against 1,118 entries, comprising 176,320 acres, the previous year. A total of about 927,240 acres, entered as cash purchases, have been patented under this law.

ARKANSAS DRAINAGE ACT.

On January 17, 1920, an act of Congress (Public No. 119) was approved which authorized local drainage districts to drain certain public lands in Mississippi and Poinsett Counties, Ark., and to subject said lands to taxation to the same extent and under the same conditions as privately owned lands are subjected to taxation for drainage purposes. The act is especially applicable to the so-called Big Lake area and to certain of the St. Francis River sunk lands. Local drainage districts have been created, and those lands have been included therein. Drainage canals are being constructed, and it is expected that the lands will be adequately drained in the near future. These lands have been subject more or less to periodical overflows during times of excessive rains, and the establishment of a proper drainage system will doubtless cause a considerable enhancement in the value of the lands and also materially benefit the health of the community.

PUBLIC SALE OF INDIAN LANDS.

Pursuant to the provisions of the act of May 29, 1908 (35 Stat. 460), and in conformity with departmental regulations of February 27, 1920, the unentered lands within the former Cheyenne River and Standing Rock Indian Reservations, N. and S. Dak., which had been subject to homestead entry for a period of seven years, were offered at public sale to the highest bidders at Lemmon, S. Dak., commencing May 27, 1920, and at Timber Lake, S. Dak., commencing June 1, 1920. After the sale had been ordered and notice thereof had been given wide publicity, numerous petitions were received asking for its postponement because of a stringency in the money market. It was determined upon investigation that the requests were not without merit, but in view of the wide publicity which had been given to the notice of the sale it was thought inadvisable to postpone it. It was therefore held as stated, with the following results:

At Lemmon 21,798.96 acres, appraised at \$34,906.75, sold for \$60,-041.85, approximately 75 per cent over the appraisals.

At Timber Lake 174,285 acres, appraised at \$428,091, sold for \$574,229.

In all, 196,083.96 acres, appraised at \$462,997.75, sold for \$634,-270.85, making the selling price \$171,273.10 over the appraisals.

Notwithstanding the stringency in the money market, nearly all settlers on the reservation were able to secure funds with which to buy adjoining tracts.

PRIVATE CLAIMS WITHIN INDIAN PUEBLOS.

By the act of July 22, 1853 (10 Stat. 309), the surveyor general of New Mexico was required, under the instructions of the Secretary of the Interior, to ascertain the origin, nature, and extent of all claims to land under the laws, usages, and customs of Spain and Mexico, and to make full reports to the Secretary of the Interior, to be laid before Congress for final action, "with a view to confirm bona fide grants, * * * also to report as to all pueblos, the extent, locality, number of inhabitants, and nature of title of each."

The instructions, approved August 25, 1854, informed the surveyor general that by Mexican statutes the Pueblo Indians were entitled to the privileges of citizenship under the Mexican law, and that since the occupancy of the Territory by the Government of the United States the Territorial legislature of 1847 had passed an act providing:

That the inhabitants within the Territory of New Mexico known by the name of Pueblo Indians, and living in towns or villages built on lands granted to such Indians by the laws of Spain or Mexico, and conceding to such inhabitants certain land and privileges, to be used for the common benefit, are severally hereby

created and constituted bodies politic and corporate, and shall be known in law by the name of the "Pueblo," etc. (naming it), and by that name they and their successors shall have perpetual succession, sue and be sued.

The act of March 3, 1857 (11 Stat. 184) appropriated \$3,750 for the survey of the exterior boundaries of the Indian pueblos; and the act of December 22, 1858 (11 Stat. 374), confirmed the Indian pueblo land claims therein described, designating them as (for example) "C Pueblo of San Juan in the County of Rio Ariba."

And the Commissioner of the Land Office shall issue the necessary instructions for the survey of all of said claims, as recommended for confirmation by the said surveyor general, and shall cause a patent to issue therefor as in ordinary cases to private individuals: *Provided*, That this confirmation shall only be construed as a relinquishment of all title and claim of the United States to any of said land, and shall not affect any adverse valid rights, should such exist.

In pursuance of that act, the Pueblo of San Juan was surveyed in townships 21 and 22 N., Rs. 8 and 9 E., New Mexico meridian, containing 17,544.77 acres, and was patented November 1, 1864. The patent contained the stipulation expressed in said act of Congress and was issued "unto the Pueblo of San Juan in the county of Rio Ariba, aforesaid, and to the successors and assigns of said Pueblo of San Juan." The patentee is described as a body "politic and corporate," as created by the Territorial legislature.

At the request of the Commissioner of Indian Affairs, and under instructions from this office, dated July 9, 1913, to A. F. Dunnington, topographer, surveys of the boundaries of individual claims in the patented Pueblo were made, and the plats were accepted July 23, 1917, and copies transmitted to the Indian Office, and to the surveyor general and the United States land office under date of February 14, 1918. Each plat bears a recital reading:

The data shown on this plat are simply a portrayal of conditions existing on the ground at the time of the survey in the field, without recognizing, establishing, or admitting any right of occupancy, title, or ownership, legal, equitable, or otherwise, in any person or persons, whose names may appear hereon or to any lands covered hereby.

The tracts were represented on the plats in connection with the names of the several claimants as "private claims," and in some instances proof was submitted to the surveyors in the same manner as is required by claimants under the provisions of law governing "small holding claims" in New Mexico and Arizona.

During the past year more than 100 applications for patents to "private claims" within the Pueblo of San Juan have been received at this office and have been transmitted to the Commissioner of Indian Affairs. The applicants have been advised in each instance that the land was within a patented Indian pueblo and therefore not under the jurisdiction of this office, and of the disposition made of the application.

EXTENSIONS OF TIME TO MAKE PAYMENT.

Persons formerly in the military or naval service were relieved from the necessity of making payments in connection with their entries during the period of such service by section 501 of the act of March 8, 1918 (40 Stat. 448). It became necessary to determine when the payments should be required of such persons after the period of the military or naval service. Instructions covering this matter were approved by the department June 9, 1920. These instructions provide:

Where the duration of the military or naval service is one year or less, the time of payment of each installment maturing during or after the term of the military or naval service, under the law under which the entry was made, will be extended for one year; where the military or naval service is between one and two years, the extension will be for two years; and similar extensions will be granted for longer terms of military or naval service. The payments so extended will be due upon the same day of the year as now fixed, and no interest will be charged during the period of the suspension of any payment.

Successive drougths during three crop seasons on the former Fort Peck Indian Reservation, Mont., made it impossible for many entrymen on the reservation to meet the payments of purchase money due under the acts of May 30, 1908 (35 Stat. 558), and March 2, 1917 (39 Stat. 994). The department favorably reported on legislation to grant these entrymen additional time for making the payments and Congress by the act of December 11, 1919 (Public No. 97), authorized extension of time for that purpose. Appropriate instructions under the said act of December 11, 1919, were approved by the department January 23, 1920.

Because of successive drougths on the reservation many homesteaders on the south half of the former Colville Indian Reservation, Wash., were unable to make the required payments of purchase money due under the acts of March 22, 1906 (34 Stat. 80), and March 11, 1918 (40 Stat. 449). To remedy this situation, Congress by joint resolution No. 194, approved March 19, 1920, authorized extensions of time for such payments. Appropriate instructions under the said joint resolution were approved by the department May 26, 1920.

The President, by proclamation dated May 5, 1920, directed that because of drougths and adverse weather conditions purchasers and entrymen of certain lands in the ceded portion of the Crow Indian Reservation, Mont., should be allowed until the 1921 anniversaries of the dates of the sales and entries within which to make payment of amounts in arrears, interest to be paid on the sums so extended from the dates when the amounts became due to the said anniversaries at the rate of 5 per cent per annum. Appropriate instructions with reference to these extensions were approved by the department June 23, 1920.

Under date of May 13, 1918, the department directed this office not to take adverse action because of defaults in the matter of payments on entries in the part of the Standing Rock Indian Reservation, N. Dak. and S. Dak., opened to entry in 1915, under the act of February 14, 1913 (37 Stat. 675), pending the consideration by Congress of proposed legislation to extend the time for making the payments. Such legislation was not enacted; and it being thought that further delay without congressional authority was not warranted, the department, under date of March 22, 1920, approved instructions requiring the payment of the sums due.

LIEU SELECTIONS FOR LANDS IN INDIAN RESERVATIONS.

The act of April 21, 1904 (33 Stat. 211) authorizes selections of public lands in lieu of lands over which an Indian reservation has been extended. Since the passage of the act 1,420,275.76 acres have been selected and patented under this act. While these exchanges are not restricted by the act to any particular State they have with two minor exceptions all been in Arizona and New Mexico. There were patented during the year 20,475.76 acres, embraced in 15 selections, leaving pending 149 selections, covering 485,675.28 acres. There still remains 50,432.92 acres available as basis for such selections, but for which as yet no applications to exchange have been filed. There were also canceled 28 applications the area of which has heretofore been accounted for.

MINING CLAIMS.

Total acreage included in mineral entries approved during the year was 52,600, aggregating a purchase money payment of \$161,369.50.

There were 85 contests received during the year, 108 disposed of, leaving 89 pending at the end of the year.

Mineral contests usually involve claims between rival applicants, one or both claiming the land under the mineral or coal land laws, or between mineral and agricultural claimants, who join issue and undertake to establish their respective claims at a hearing ordered by the Land Department; or the result of adverse reports filed by the Field Service against mineral or coal applications, attacking the bona fides of the claimants or questioning the mineral character of the land. The lands involved in litigation of this character usually are of special value, and often the basis of large investments; hence we have contests over coal and mineral applications, between mineral and town-site claimants, mineral and homestead and other agricultural filings and mineral claims to lands included in railroad, State, and other selections.

Applications for patents for oil placer claims covering land in the petroleum fields, whether withdrawn or in special reserves, often of great value, have received special attention during the past year. Consideration of cases of this character has been expedited on account of the provision in the mineral-leasing law, act of February 25, 1920, which limits the filing of applications under certain of its relief provisions to six months after the passage of the act. Approximately 30 per cent of the contests disposed of during the year were oil cases; a special note of which is made herein under the title of Oil-land claims, page 8. In view of the large values and the many new legal questions involved, the records of the hearings were of unusual magnitude and called for the most laborious and careful consideration.

ALASKA COAL LANDS.

During the year a part of the Cook Inlet coal field was surveyed and divided into 19 leasing blocks, containing in the aggregate about 9,500 acres, and was offered for lease. One lease has been awarded to these lands.

An additional block containing 565 acres, and designated as No. 26, was surveyed in the Nenana field and offered for lease, for which a lease has been awarded.

One application to lease 2,040 acres of land in the Bering River field, and an application to lease 1,080 acres in the Matanuska field have been received during the year, and notice of the application published, preparatory to final action thereon.

At the present time we have under lease in the Bering River field 4,500 acres, in the Matanuska field 2,840 acres, Cook Inlet field 1,400 acres, and in the Nenana field 565 acres; a total of 9,305 acres.

POTASH LANDS.

One potash lease covering 980 acres of the Searles Lake deposit was issued during the year, making a total of 10 leases outstanding for the Searles Lake land. There is one outstanding lease of Sweetwater County, Wyo., lands. There were a total of 143 applications for potash prospecting permits received during the year, on which 61 permits were granted. Total potash permits issued under the law, 162. Two applications for patent under claims of discovery as the result of prospecting under potash permits have been received. No patents have yet been issued under this provision of the law. A patent was granted to the Utah Salduro Co. for an area of 30,658 acres of land in the Salt Lake Desert, title to which was established under placer mining locations made prior to the date of the leasing law. The purchase money paid on this entry amounts to \$76,645.

This entry covered probably the largest area ever patented under one mineral application. The company extracts the potash salts from brine collected by means of an extensive system of dikes, ditches, and canals covering a large area. Thus another section of country so arid and alkaline as to be considered worthless is being made to supply a valuable commercial product.

The potash industry in this country is in a rather uncertain condition at the present time owing to the possibility of foreign competition. While the prices obtained during the war and up to the present time have been sufficient to enable the principal Searles Lake concern to operate successfully, if the foreign supply should result in materially reducing the price it is not unlikely that Searles Lake would be unable to compete, in the absence of the development of much cheaper methods of refining.

COAL ENTRIES.

Coal land entries covering a total acreage of 6,256 acres were approved for patent, the purchase money amounting to \$370,267.

MINERAL LEASING LAW.

In my annual report for 1917 I expressed the opinion that the stock-raising homestead act was the most important and far-reaching land legislation that had been enacted for many years; but that act was merely a modification and expansion of principles and policies inaugurated in 1862, and ever since continued as the principal method for disposing of the public domain. With the mineral leasing act, we have an entirely new principle and policy injected into our public-land system; it may be said, therefore, to mark the beginning of a new epoch in the handling and disposition of the country's natural resources, for it is important not only because of the change of policy, but because of the tremendous interests that will be affected. As to the ultimate direct and indirect influence of this new policy on our industrial, social, and economic life, it is of course unsafe, at this time, to make any predictions other than to state that the possibilities are large. The homestead law of 1862 and the mining acts of 1866 and 1872 are usually looked upon by thinking men as among the greatest contributory factors to the unprecedented development, particularly in the West and Middle West, of the productive and industrial resources of the country during the past half century; yet in all probability those of the broadest vision at the time would hardly have forecasted the results we now see, and many were disposed to take a very pessimistic view. It required a fight of a decade or more to break away from the old cash sales system, under which the land was gravitating into a comparatively few great estates,

and to substitute the homestead law therefor; it has taken about the same length of time to bring about this leasing policy whereby the title to certain of the great and necessary resources will remain in public ownership.

Our anticipations and apprehensions as to the activity, problems, and difficulties under this act have been fully confirmed as far as we have gone. Applications under the act began to come in by telegraph the day it was signed; there has been no let-up since. The task of preparing the regulations for the administration of the act was one requiring the most diligent attention for several weeks, and no account has been kept of the hundreds of communications since in construing and applying the act. The greatest activity, of course, was to secure oil land leases and permits. A number of local offices have been literally swamped. It happened that in some sections, particularly in Wyoming and Montana, important and unexpected discoveries were made at just the time of the passage of the act. The result was that the entire area for a hundred miles around at once became prospectively valuable for oil with the consequent interest and excitement. As nearly as we can estimate at present, probably 5,000 applications for prospecting permits have been filed. It is the exception rather than the rule to find an application not in conflict with another; in some cases an application will have as many as 20 conflicts. The claimed priorities, together with the various preference rights provided by the act, have presented a multitude of questions too numerous and varied to discuss here. We have had to provide a special organization to handle this work. As yet comparatively few applications under the relief provisions of the act have reached this office; consequently, the business under the act representing the great values had at the close of the fiscal year, scarcely been touched.

NATIONAL FORESTS.

Since the issuance of my last annual report four national forests have been enlarged and nine reduced under the act of June 4, 1897 (30 Stat. 34, 36), five have been enlarged under special acts of Congress, and under the provisions of the act of March 1, 1911 (36 Stat. 961), four national forests have been established and five enlarged. Certain consolidations and interforest transfers have also been effected, and an exchange has been authorized between the State of Nebraska and the United States of certain school lands in the Nebraska National Forest for public lands therein. A large area of forest land in central Idaho, containing approximately 1,095,020 acres, has been added to the Idaho and Payette Forests under the act of October 29, 1919 (41 Stat. 324), and by or under authority of specific acts certain additions have been made to the Ochoco and

Oregon Forests, in Oregon, and Wyoming Forest, in Wyoming. The area which has been included in national forests during the fiscal year from the public domain is 1,394,787 acres, and that through acquisition by the United States under the said act of March 1, 1911, commonly known as the Weeks law, aggregates 640,974 acres. Due to the fact that the entire area within the exterior boundaries of the forests established under said act has been included in the gross total for this year, instead of merely the lands acquired or approved for purchase therein as heretofore, an increase of 4,072,054 acres has been effected.

There are now 152 national forests, embracing 180,299,776 acres, of which a little over 86 per cent is public land. The net increase in national forest area since the beginning of the fiscal year is 6,038,383 acres. During the year, 69,432 acres have been excluded from national forests, 340 acres thereof withdrawn for other purposes, and the public lands in the remaining area and in 5,683 acres released from temporary or other withdrawals for forest purposes have been restored to entry and other disposition. Under the provisions of the act of June 25, 1910 (36 Stat. 847), the public lands in 20,332 acres have been withdrawn for forestry purposes or in aid of forest reservation legislation, the area embraced in withdrawals for such purpose at the close of the fiscal year being 568,927 acres.

During the fiscal year 5 administrative sites, embracing 361 acres, have been withdrawn by Executive orders under the above-mentioned act of June 25, 1910, for use by the Forest Service in the administration of certain national forests, and 53 withdrawals for such purpose have been revoked, covering 6,113 acres. There are now 10 rights of way for wagon roads and 926 administrative sites withdrawn, embracing 214,958 acres, 159 sites, covering 19,901 acres, being near national forests, and 767 sites, embracing 195,057 acres, in national forests.

LIEU SELECTIONS FOR LANDS IN NATIONAL FORESTS.

Many forest lieu selections presented under the act of Congress of June 4, 1897 (30 Stat. 36), had as bases for the selections lands formerly owned by the States of Oregon and California, title to which had been secured from those States through the fraudulent practices of one Hyde and his associates, and are the lands involved in the well-known Hyde-Benson frauds. Some time in 1912 the State of Oregon instituted suit to recover the lands so acquired from it. In the trial of that suit it had the cooperation of the General Land Office and the aid of its field agents, and most, if not all, of the evidence used by the State was obtained by such agents. The litigation resulted in a decision by the Supreme Court of the State of

Oregon in the case of the State of Oregon *v.* Hyde et al. (169 Pac. Rep. 737, decided Jan. 8, 1918, and 171 id. 582, on review, decided Mar. 19, 1918). The court held in that case that with respect to those selections that had been approved by the General Land Office, and some were approved before the Land Office knew of the fraud affecting them, it had no jurisdiction to determine title, for the reason that the approval was tantamount to an acceptance of the base lands by the Government, and in the case before the court the United States, the owner of the base lands, and a necessary party to the suit, had not been made a party. As to the other cases involved in the suit, where the selections were still pending in the Land Office and unapproved, the patents from the State in nearly all of them were vacated and title to the State restored.

Following that decision, the General Land Office has been holding for cancellation all lieu selections founded on a base that the Oregon court found to be fraudulently acquired and title to which was restored to the State. In the approved selections as to which the court held it had no jurisdiction, the adverse proceedings pending against them that had been held suspended in the local offices to await the outcome of the court proceedings were revived. It was the purpose of the Land Office to prove the fraud in these cases by the evidence offered in the trial of the court case. Pending final action on those so-called approved cases, the State of Oregon and the selectors, or their representatives, entered into an arrangement whereby an additional payment of money would be made to the State and the State would quitclaim either to the selectors or to the United States all its right, title, and interest in the base lands, and thereby enable the United States to secure absolute and indefeasible title to them. This arrangement was to be subject to the approval of the land department. By his letter of May 3, 1920, to the Commissioner of the General Land Office, the First Assistant Secretary gave directions to suspend proceedings:

Against any and all such selections where the only objection is alleged invalidity of the title to the base lands procured from the State of Oregon, and call upon the State for quitclaim deeds running to the United States for such tracts tendered as may be necessary to satisfy the selection.

Those directions were being carried out when, on July 9, 1920, the Assistant Secretary informed the commissioner that the Acting Secretary of Agriculture, by letter of July 8, 1920, protested against carrying into effect the compromise agreement between the State of Oregon and the selectors in so far as it affected selected lands now within national forests, and directed withholding of action on all such cases where the selected lands are within the limits of a national forest until further advised, but to proceed with other cases outside of national forests under former instructions.

Of the Oregon cases there were pending on the 1st day of July, 1919, 86 selections. Of that number, 34 have been canceled because of the court decree vacating the State's patent to the base land, and 52 are now pending for action by the General Land Office. Seven have been clear listed by the field-service division of the General Land Office and referred to the adjudicating division for approval for patenting under the compromise arrangement between the State and the selectors under the direction of the Secretary of May 3, 1920, referred to. None of these so clear listed have yet been patented. Seventeen of the pending selections are affected by the Assistant Secretary's order of suspension of July 9, 1920, because of the Agricultural Department protest.

With respect to the selections predicated upon bases of California lands the department decided April 1, 1918, in the case of F. A. Hyde & Co. on rehearing (46 L. D. 34) that where the State patented the base land to a person in being the State patent is not void and not now voidable, a suit to declare it void being barred by the California statute of limitations, the selections should be approved, as thereby undoubted title to the base lands would be vested in the United States. Following that decision 44 selections with California bases have been patented since the 1st day of July, 1919. The action following that decision left pending of the California cases practically only those where the charge involved was that the patentee from the State was a fictitious person, for in the decided Hyde case, referred to, the ruling was not made to include that class. Of that class there were pending on the 1st day of July, 1919, 146 selections.

With respect to this class the land department practice followed the ruling of the Secretary announced October 20, 1910 (unpublished), in the case of F. A. Hyde & Co., William Bryan, attorney in fact (Seattle 01916), holding that a careful search for the patentee of the State without success, inquiry for him where he or those using that name gave his address, is prima facie evidence of his non-existence, and that:

In such a case the present claimant, whoever he may be, or however remote from F. A. Hyde & Co., is, in law, conclusively held to knowledge of his existence and to be able to point him out and satisfactorily prove his existence and identity.

Following that ruling, 26 selections have been held for cancellation since the 1st day of July, 1919. Twenty-two were appealed to the Secretary. None have been canceled. By his decision of May 8, 1920, in the case of Frederick A. Kribs, attorney in fact for F. A. Hyde (Roseburg 02654), the Secretary reversed the ruling announced in the Hyde case (Seattle 01916), holding, in effect, that in a hearing on a charge that a patentee from the State is a fictitious person, the Government to establish its case must show by clear, unequivocal

cal, and convincing testimony that the patentee was, as charged, a fictitious person, and that the burden is upon it to so show, and that—

Every presumption that can be invoked in a case of this character, where a patent is the subject of attack, must be indulged in favor of the patent.

Since the decision in this Kribs case, eight selections involving the charge of the fictitious character of the State's patentee have been patented.

August 13, 1920, the Solicitor for the Department of Agriculture requested the Commissioner of the General Land Office to withhold the issuance of patents in a number of cases listed until further consideration of them could be had by the Secretary of the Interior. It is found that the cases so listed by the solicitor involve the question of the fictitious character of the State's patentee, and would have been disposed of under the holding in the Kribs case. By his instructions to the commissioner of August 19, 1920, the First Assistant Secretary of the Interior directed that as the facts in the cases listed by the solicitor are practically identical, patents in all similar cases should be withheld until the determination of a petition for rehearing from the Agricultural Department. There are now pending 146 selections involving the question of the fictitious character of the State's patentee, and 111 are now pending on appeal to the Secretary.

WITHDRAWALS AND RESTORATIONS.

During the past year 5,394,799 acres of public lands were withdrawn or placed in a state of reservation under the various acts applicable thereto and 4,199,647 acres theretofore withdrawn have been restored.

Some of the withdrawals overlap in part former withdrawals for other purposes and some are blanket withdrawals without strict regard to lands entered or patented, so that the total of withdrawn lands does not represent with strict accuracy the amount of public unentered lands withdrawn. The same may be said of restorations. Some lands restored were included in other forms of withdrawals, and so did not become open to entry or other disposition upon restoration, and some of the restorations were made for the reason that the lands restored were patented or covered by entries.

The withdrawals and restorations during the year follow:

STOCK DRIVEWAYS.

Under section 10 of the act of December 29, 1916 (39 Stat. 862), 2,406,815 acres have been withdrawn and 132,088 acres released from former withdrawals. For summary of action in this matter see Stock driveways (p. 38).

NATIONAL FORESTS.

Approximately 1,394,787 acres have been added to national forests from the public domain, and the public lands in 20,332 acres have been withdrawn under the act of June 25, 1910 (36 Stat. 847), for forest purposes or in aid of forest-reservation legislation. The public lands in 69,092 acres excluded from national forests and in 5,683 acres released from withdrawal for forest purposes have been restored to entry and other disposition.

COAL, PETROLEUM, OIL SHALE, AND POTASH.

Two thousand seven hundred ninety-seven acres were withdrawn for coal classification and 1,293,307 acres previously withdrawn have been restored. There have been no withdrawals during the year for petroleum, potash, or oil shale, but 954 acres have been restored from previous petroleum withdrawals, 89 acres from potash, and 3,880 from oil-shale withdrawals.

POWER SITE.

By 31 orders of withdrawal, 62,094 acres were placed in reserves for hydroelectric-power and transmission-line purposes and 41,046 acres previously withdrawn were restored by 23 orders.

PUBLIC WATER RESERVES.

Eighteen Executive orders withdrew 14,367 acres as public water reserves and 85 acres theretofore withdrawn were restored.

RECLAMATION.

Forty orders of withdrawal and 101 orders of restoration were promulgated under the provisions of the act of June 17, 1902 (32 Stat. 388), whereby 874,705 acres were withdrawn from disposition and 2,178,315 acres restored.

CAREY ACT.

Under section 4 of the act of August 18, 1894 (28 Stat. 372), and acts amendatory of and supplementary thereto, 610,835 acres have been withdrawn from general disposition for the benefit of the various States applying therefor, and 467,908 acres theretofore withdrawn have been restored.

MISCELLANEOUS.

Under the act of June 8, 1906 (34 Stat. 225), 2,294 acres were reserved for national monument purposes and 320 acres were withdrawn pending classification under said act. In Arkansas 5,453 acres in Golden and Youngs Lakes were withdrawn by a depart-

mental order, and the public lands, if there be any, which fact is to be determined later, in two townships were withdrawn by an Executive order pursuant to the act of June 25, 1910 (36 Stat. 874), pending adjustment of alleged faulty or incomplete surveys, a similar Executive order withdrawing public lands, if there be any, in four townships bordering on Great Salt Lake, Utah, was issued. Restorations included approximately 500 acres in the Arkansas sunk-land area which had previously been withdrawn by Executive order, and approximately 57,000 acres in the so-called lake and sunk-land areas of Arkansas, suspension of the issuance of final certificates and patents for which had been directed by departmental orders, through vacation of such orders; under the act of June 25, 1910, supra, 1,714 acres were withdrawn as reservoir sites.

RESTORATIONS AND OPENINGS SUBSEQUENT TO PUBLIC RESOLUTION NO. 29.

Pursuant to public resolution No. 29 of February 14, 1920, a period of not less than 60 days prior to the date of disposition to the general public has been fixed in our orders effective since that date restoring surveyed public or Indian lands to entry, during which qualified ex-service men of the war with Germany might exercise the preferred right to enter the lands under the homestead and desert-land laws, where both of such laws were applicable, or otherwise under the former only, to which they are entitled under such resolution. The area which has been restored under such orders from February 15 to the close of the fiscal year is 718,414 acres. During this period also official plats of newly surveyed or resurveyed areas, aggregating 4,502,151 acres, have been filed and the unreserved public lands involved opened to entry subject to the soldiers' preference above referred to, and it is estimated that the greater portion of this area was subject thereto.

CONTESTS.

Among the duties imposed upon the General Land Office is the adjudication of cases which arise out of disputed questions of law and fact (1) between adverse claimants for the same tract of land under the settlement laws, or based on priorities otherwise founded; (2) between entrymen or claimants of public land on one side and contestants charging illegality or failure to comply with the law and seeking cancellation of the existing entries or claims with a view to procuring a preference right of entry under the act of May 14, 1880; (3) upon Government proceedings on like charges based on the investigations of special agents of this office or by officials of the Forest Service, where in the latter case the lands are in national forests. These cases involve homesteaders, miners, desert land, and timber

and stone claimants contending for the same land under different laws; or cases involving controversies between claimants and States over lands alleged to be swamp in character, or cases involving extensive conspiracies for the acquisition of public lands. The questions presented in these several cases can only be determined after a hearing regularly had at which testimony is introduced on all phases of the matter involved.

The volume of this work is but little affected either by the gradual diminution of our public lands, the prosperity of our people, or the general stress of financial conditions. If the land is in fact desirable, there will always be more than one claimant, not only ready to exercise his rights under the law but also to see that no one else gets the title without compliance with the statutory requirements.

In the year ending June 30, 1920, the office disposed of 780 litigated cases. All contests filed do not result in hearings, as many entries are canceled under the rules of practice for default of the entrymen in serving and filing answer to contest charges, and many contests are dismissed for failure of the contestant to prosecute the same. During the past year 2,624 contests were disposed of under this procedure.

The figures given above are confined to contests exclusive of those involving claims under the mining laws, which in themselves present questions exceedingly difficult of solution, upon which immense values are often dependent. Special comment on this class of work will be found under the head of Mining claims (p. 76).

REPAYMENTS.

The existing laws governing repayments (sec. 2362, United States Revised Statutes), act of June 16, 1880 (21 Stat. 287), and the act of March 26, 1908 (35 Stat. 48), provide for the return of moneys covered into the Treasury of the United States received in connection with the disposal of the public lands, to be repaid to the entryman, his heirs or assigns or his legal representatives, in the absence of fraud on their part, in all cases where lands have been erroneously sold; where money has been paid by innocent parties on fraudulent and void soldiers' and sailors' additional homestead entries; where entries were canceled for conflict; where entries are erroneously allowed and can not be confirmed; where applications to make entry, filing, selection, etc., are rejected; and where any amount has been paid in excess of the legal requirement.

Under said laws there were stated during the last fiscal year 1,426 accounts, allowing repayment of \$140,292.94, and during said period there were denied 419 claims for repayment. This number of claims allowed and the amount repaid include 63 accounts allowing repay-

ment of \$9,404.78, received in connection with sale of various Indian reservation lands and repaid from Indian trust funds.

Repayment claims, allowed and denied, by years.

Year.	Claims allowed.	Amount.	Claims denied.	Year.	Claims allowed.	Amount.	Claims denied.
1911.....	2,338	\$178,437.02	712	1916.....	1,700	\$218,971.46	940
1912.....	2,097	178,952.15	619	1917.....	1,215	106,888.42	434
1913.....	2,427	217,614.09	644	1918.....	1,241	99,370.04	435
1914.....	1,775	123,139.11	482	1919.....	762	80,896.70	285
1915.....	1,689	306,310.83	799	1920.....	1,426	140,292.94	419

PATENTS.

Table showing the number of patents issued and area patented by fiscal years from 1911 to 1920, inclusive.

Year.	Patents.	Acreage patented.	Year.	Patents.	Acreage patented.
1911.....	72,189	12,272,475.44	1917.....	54,124	11,313,362.24
1912.....	67,475	10,135,475.02	1918.....	48,620	9,562,482.22
1913.....	63,496	12,678,076.81	1919.....	55,490	10,777,001.35
1914.....	73,999	14,391,071.85	1920.....	65,734	11,850,401.34
1915.....	61,979	13,025,427.98			
1916.....	55,324	12,161,807.99		618,430	118,157,582.24

For many years the opinion has been prevalent that the volume of patent work has reached the point where it must begin rapidly to decline. An inspection of the figures covering the work of the last two decades does not justify this conclusion. During the decade from 1901 to 1909, inclusive, the total number of patents issued was 625,125, an average of 62,512 patents annually. For the decade just closed, as shown by the foregoing table, a total of 618,430 patents was issued, covering a total area of 118,157,582 acres, an annual average of 61,843 patents, with an average annual area of 11,815,758 acres patented, while during the fiscal year just closed 65,734 patents were issued, covering 11,850,401 acres. This does not include 1,138,023 acres covered by Indian fee patents, the area having been reported when trust patents issued. As a matter of fact, by reason of the lengthy descriptions involved in describing the lands included in entries under the enlarged-homestead act, the stock-raising homestead act, the numerous small aliquot parts of legal subdivisions, or the metes and bounds descriptions involved in forest homestead entries, and the numerous reservations of coal, oil, oil shale, gas, potash, and other minerals, all the work incident to posting and adjudicating entries and writing and examining patents has very materially increased.

CERTIFIED COPIES.

With land values rapidly increasing has come a greater insistence on the part of abstractors and purchasers that the first link in the

chain of title be evidenced by production of the original patent, or a certified copy from its record in all cases where such instruments are not already of record in the county. This has caused a steady annual increase of orders for copies of patent records, and has emphasized the fact that hundreds of thousands of these muniments of title have never been recorded in the local records of the county. This has involved a steadily growing volume of correspondence and large increases in status and file work, as in nearly every instance an order for a copy involves a search of the tract book to identify the entry, drawing the entry papers from the files, checking the description, drawing, marking, and photographing the patent record, trimming, certifying, and transmitting the copy, and refiling the patent record and entry papers. During the decade from 1901 to 1910, inclusive, the annual output increased from 7,668 copies in 1901 to 23,917 in 1910, an average annual production of 15,419 copies. In the decade just closed, the annual average was 30,379, increasing from 25,916 copies in 1911 to 56,452 for the fiscal year ending June 30, 1920. In the month of March, the annual "peak-load" month in this class of work, 8,648 copies of patent records were furnished and 4,963 letters were received. The correspondence involved in this line of work increased from 29,028 letters received in 1919 to 41,472 in 1920, an increase of 43 per cent. The entire output of photographic work for the year, including copies of patent records, letter books, papers, plats, tract books, abstracts, etc., approximated 110,000 pages.

It would be a good move in economy of time and a convenience to the public if these copies could be sent C. O. D. by parcel post.

Table showing the number of certified copies of patent records furnished, by fiscal years from 1901 to 1920, inclusive.

Year.	Number.	Year.	Number.
1901.....	7,668	1911.....	25,916
1902.....	12,023	1912.....	24,370
1903.....	14,641	1913.....	23,543
1904.....	11,913	1914.....	25,130
1905.....	10,566	1915.....	20,209
1906.....	15,364	1916.....	28,228
1907.....	18,517	1917.....	29,304
1908.....	19,420	1918.....	43,106
1909.....	20,165	1919.....	27,457
1910.....	23,917	1920.....	56,452
Total.....	154,194	Total.....	303,787
Average.....	15,419	Average.....	30,379

LAND SERVICE BULLETIN.

The Land Service Bulletin, a monthly publication, was established March 1, 1917, in the General Land Office as a medium of direct communication between the different branches of the Land Service, both in the field and office work, so that uniformity of action in the

administration of public lands might be assured through a thorough dissemination of the laws and principles involved in the statutes, decisions, and regulations. Later experience has shown that it not only affords a means for the prompt publication of new legislation, announcement of the important regulations, changes in procedure, special instructions that affect the service generally, and information of public-land openings and restorations, but also the opportunity of securing practically a personal conference between the officials of the land department affected and interested in these matters. Through the Bulletin district officers, surveyors general, chiefs of field divisions, field officers of the survey in force, as well as the officials at headquarters, may present and discuss all difficulties attendant upon the enforcement of existing statutes or regulations with a view to amendatory legislation or executive relief. A more thorough community of interest and more effective administration is thus brought about within the Land Service, a result which justifies the continuance of the publication.

In fact, the Bulletin has come to be regarded as a necessity; it serves a purpose not accomplished by any other circular or publication of the bureau; indeed, we can hardly see how we did without it so long. During recent months there has been much demand for it from outside the service, and in numerous instances our field officers have used it as a basis of information to the press on matters in which the public would be interested. While the present plan of mimeographing a small edition of the Bulletin for the service only, accomplishes the primary purpose of the publication so far as the bureau is concerned, it appears to me that this publication might well serve a much larger field of usefulness if it were printed in larger numbers for the benefit of the public, particularly through the press of the public-land States. I am suggesting an estimate therefor accordingly.

IMPORTANT PUBLIC-LAND LEGISLATION.

This is the eighth annual report that I have had the honor to submit as Commissioner of the General Land Office; during that period our public-land laws have been largely made over in many radical and constructive features. In a general way this may be understood, but only a study of the public-land legislation of this period can give a full appreciation of the fact. The period is indeed epochal in its effect upon our public-land policies, in so far as our great body of grazing lands has been dedicated to the small farmer and stock grower, the conservation of our mineral wealth, and water-power resources has taken practical form, and the ultimate development of Alaska assured by the construction of a railroad to her future agricultural center. The above statement will

become apparent from the following brief summary of this important and far-reaching legislation:

(1) *Alaskan Railroad*.—The act of March 12, 1914 (38 Stat. 805), authorizing the President of the United States to locate, construct, and operate railroads in the Territory of Alaska.

(2) *Unrestricted patent*.—The act of April 14, 1914 (38 Stat. 336), providing for the issuance of an unrestricted patent where theretofore patent had been issued limited to surface rights only, and subsequently the lands so patented have been classified as noncoal in character.

(3) *Agricultural entry with reservation of mineral to the United States*.—The act of July 17, 1914 (38 Stat. 509), providing for agricultural entry of lands withdrawn, classified, or reported as containing phosphate, nitrate, potash, oil, gas, or asphaltic minerals, with the reservation of the minerals to the United States.

(4) *Reclamation extension act*.—The act of August 13, 1914 (38 Stat. 686), extending the time for the payment, under reclamation projects, for water rights from 10 to 20 years.

(5) *Contracts with oil or gas applicants*.—The act of August 25, 1914 (38 Stat. 708), authorizing the Secretary of the Interior to enter into agreements, under such conditions as he may prescribe, with applicants for patents for oil or gas lands, relative to the disposition of the oil or gas pending final determination of title to the land.

(6) *Alaskan coal lands*.—The act of October 20, 1914 (38 Stat. 741), providing for the lease of coal lands in Alaska.

(7) *Placer phosphate locations*.—The act of January 11, 1915 (38 Stat. 792), validating placer locations of phosphate deposits, though such claims should have been taken as a lode formation.

(8) *Enlarged homestead*.—The act of March 3, 1915 (38 Stat. 956), amending the enlarged homestead law, so as to permit additional entry thereunder, although proof may already have been submitted on the original.

(9) *Relief of desert-land entrymen*.—The act of March 4, 1915 (38 Stat. 1161), granting an extension of time within which the entryman can show compliance with the desert-land law or secure an entry of the lands by perfecting his claim under the homestead law.

(10) *Enlarged homestead entry*.—The act of March 4, 1915 (38 Stat. 1162), authorizing applications for the entry of lands not theretofore designated as subject to such appropriation, with the provision that the application should constitute a segregation of the lands applied for.

(11) *Second reclamation homestead*.—The act of March 4, 1915 (38 Stat. 1215), providing that, where homestead entries have been made within reclamation projects, and it is found that the land is not susceptible of reclamation, the entryman may make a new entry of any farm unit within such project.

(12) *Oregon & California Railroad grant lands*.—The act of June 9, 1916 (39 Stat. 218), revesting in the United States 2,300,000 acres of lands estimated at various figures from thirty to fifty million dollars.

(13) *Leave of absence to homestead settlers*.—The act of July 3, 1916 (39 Stat. 341), authorizing a leave of absence to homestead settlers upon unsurveyed land.

(14) *Amendment of the enlarged homestead act*.—The act of July 3, 1916 (39 Stat. 344), conferring upon any person who has made homestead entry of less than 320 acres of land designated as nonirrigable and who shall have submitted final proof therefor, the right to enter public land, subject to the act, not contiguous with the first entry, which shall not therewith exceed 320 acres.

(15) *Alaskan homestead.*—The act of July 8, 1916 (39 Stat. 352), amending the homestead law applicable to the Territory of Alaska so as to reduce the general right of entry from 320 to 160 acres; this action taken in accordance with a memorial of the Alaskan Legislature.

(16) *Military service of homesteader.*—The act of August 29, 1916 (39 Stat. 671), extending the provisions of the act approved June 16, 1898, so as to make it applicable to all cases of military service rendered in connection with operations in Mexico or along the borders thereof; the absence of the settler enlisted as a soldier is equivalent to residence upon his homestead claim.

(17) *Stock-raising homestead.*—The act of December 29, 1916 (39 Stat. 862), authorizing the entry of 640 acres chiefly valuable for grazing purposes.

(18) *Potash lands.*—The act of October 2, 1917 (40 Stat., 297), authorizing exploration for and disposition of potash.

(19) *Free homestead surveys in Alaska.*—The act of June 28, 1918 (40 Stat., 632), providing for the free survey of homesteads where the settler has gone upon unsurveyed lands.

(20) *Resurveys.*—The act of September 21, 1918 (40 Stat., 965), authorizing resurveys on an equitable division of the cost between the applicant and the Government, in proportion to the extent of their respective holdings.

(21) *Coo's Bay wagon-road lands.*—The act of February 25, 1919 (40 Stat., 1197), authorizing the reconveyance to the United States of 93,000 acres theretofore granted.

(22) *Mineral leasing law.*—The act of February 25, 1920 (Public No. 146), authorizing the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain under leases obtained from the United States.

(23) *Federal water-power act.*—The act of June 10, 1920 (Public No. 280), creating a Federal water-power commission; to provide for the improvement of navigation; the development of water power; and the use of public lands in relation thereto.

(24) *War-relief legislation.*—Special legislation, addressed to conditions due to the war with Germany, has been provided in the following cases:

The act of July 28, 1917 (40 Stat., 248), for the relief of homestead settlers, applicants, and entrymen.

The act of July 17, 1917 (40 Stat., 243), to relieve the owners of mining claims from performing assessment work.

The act of August 7, 1917 (40 Stat. 250), for the protection of desert-land claimants.

The act of August 10, 1917 (40 Stat. 273), authorizing the Secretary of the Interior to suspend certain provisions as to residence under the reclamation laws.

The act of October 5, 1917 (40 Stat. 343), relieving mining claimants from performance of annual assessment work during the years 1917 and 1918.

Act of October 6, 1917 (40 Stat. 391), authorizing the execution of affidavits of soldiers before commanding officer.

Act of December 20, 1917 (40 Stat. 430), authorizing the absence of homesteader for purpose of engaging in farm labor.

Act of March 8, 1918 (40 Stat. 448), affording general protection to the civil rights of persons in the military service.

Act of August 31, 1918, section 8 (40 Stat. 957), authorizing homestead entry by soldiers under the age of 21.

Act of February 25, 1919 (40 Stat. 1161), extending the provisions of the homestead law in the matter of credit for the period of enlistment to the soldiers, nurses, and officers of the Army and Navy.

Public resolution No. 29, approved February 14, 1920, giving to discharged soldiers, sailors, and marines a preferred right of homestead entry.

ADMINISTRATIVE RECORD.

The radical changes in our public-land laws, noted above, have necessarily called for a corresponding amount of original research and constructive work here in the preparation of reports and recommendations to Congress, while such measures were in the formative stage, and in like degree our current administrative work has presented increasing difficulties, due to the preliminary study that must be given all new legislation prior to the formulation of executive procedure thereunder. In the meantime the demands of the current work have increased. Not only, contrary to popular belief, is the public-land business not on the decline but the administrative work of handling that business, due to the complications of the new legislation and more effective administrative policy, has at least doubled. Under these circumstances the actual volume of current business transacted is so informative as to the general interest and activity in public-land matters, and such a testimonial of effective industry on the part of the force, despite the handicap of conditions growing out of the war, as to justify the following brief summary of the accomplishments of the Land Department during the fiscal years 1913-1920, inclusive:

- (1) Public and Indian lands originally entered and allowed, 122,489,236 acres.
- (2) Granted 477,629 patents.
- (3) Patented 95,749,627 acres, of which area 66,228,477 acres were patented under the homestead law.
- (4) Collected from all sources \$45,986,196.26.
- (5) Expended for maintenance of service \$24,578,796.53.
- (6) Accepted surveys and resurveys covering an area of 85,427,959 acres.
- (7) Investigated in the field and reported by the field service, 164,622 cases.
- (8) Collected and turned into the United States Treasury through the field service \$1,160,435.11.
- (9) Recovered through investigations by the field service 2,618,343 acres.
- (10) Secured through investigations in the field 520 indictments for violations of the public-land laws.
- (11) Recommended 840 civil suits as the result of field investigation.
- (12) Conducted 2,423 hearings in Government contests.
- (13) Conducted investigations on which were instituted 114 oil-land suits, notable recoveries resulting in the Elk Hills suit against the Southern Pacific Railroad Co. for 6,109 acres in naval reserve No. 1, of the value of \$10,000,000; the Ferry Lake suits in Louisiana for 617 acres of oil lands, with 23 producing wells, and a money judgment of \$462,903; nine suits in California against claimants on withdrawn oil lands with a total recovery of \$9,514,304.
- (14) Approved and certified under grants to the States 10,257,682 acres.
- (15) Patented and certified under railroad grants 9,712,938 acres.
- (16) Decided on the merits 17,411 litigated cases, exclusive of mineral contests, and disposed of on default 30,410 cases.
- (17) Opened Indian lands to homestead entry and other disposition, approximately 1,915,000 acres.
- (18) Restored to homestead entry and offered for sale abandoned military reservations, 154,640 acres.

(19) Sold approximately 692,000 acres of Indian lands, for which the sum of \$1,985,000 was received.

(20) Allowed 136 town site and kindred entries, for which the sum of \$95,177 was received.

(21) Sold 13,907 town lots, including Alaska, for which the sum of \$1,084,537 was received.

(22) Received for timber sold on the ceded Chippewa Indian lands \$1,929,805.

(23) Issued 162 potash permits and 11 leases under the act of October 2, 1917.

(24) Granted coal-mining leases for 9,305 acres of coal lands in Alaska, under the act of October 20, 1914.

(25) Opened and restored to entry, subject to the 60-day preference right of soldiers and sailors engaged in the war with Germany, under public resolution No. 29, of February 14, 1920, 5,220,565 acres.

(26) Secured the withdrawal, after investigation in the field, of 8,898,258 acres for stock driveways, under the act of December 29, 1916.

(27) Prepared and issued a new Manual of Surveys, which will hereafter govern under the present system of direct surveys.

(28) Obtained judicial decrees quieting title in the United States to approximately 104,000 acres of Arkansas "sunk" and "lake" lands, conservatively valued at \$5,200,000, and recovered the aggregate sum of \$50,000 for timber cut in trespass from these lands.

(29) Oregon & California Railroad grant lands classified in the field, 2,175,000 acres; cruised 30,000,000,000 feet of timber; opened to homestead entry 810,000 acres; sold the timber on 10,538 acres, amounting to 263,404,000 feet, for \$380,-912.27; applications received for the exchange of 85,000 acres; ascertained and paid the accrued taxes amounting to \$1,529,947.27.

(30) Classified in the field Coos Bay Wagon Road grant lands, 93,078 acres; ascertained and paid accrued taxes \$547,224.10; sold the timber on 1,120 acres for \$80,811.30.

(31) Secured as escrow deposits by oil-land claimants under the act of August 25, 1914, and special agreements, \$9,912,398.40.

(32) Patented under the Minnesota drainage act, 927,240 acres.

(33) Furnished 253,501 certified copies of patent records.

(34) Placed all work in the offices of surveyors general on a cost basis, with higher salaries, less total expense, and equal output.

(35) Devised new methods of restoration to entry of withdrawn or reserved lands whereby contests and litigation are practically eliminated.

(36) Prepared 418 separate sets of regulations and instructions for the administration of new legislation.

(37) Drafted all reports on proposed public-land legislation called for by Congress during the past eight years, many of these reports requiring much careful study and original investigation.

COMPENSATION OF REGISTERS AND RECEIVERS.

Under date of March 13, 1920, I submitted a report to you relative to the present statutory provisions governing the compensation of district land officers, recommending the enactment of further legislation, which met with your approval except as to the first proviso thereof. In order that the data assembled as a result of study given this question may be preserved for future convenient reference it is made a part of the present report. It is impracticable to here ex-

tend the tabulated sheets referred to in said report, but the substance thereof may be readily understood from the totals that have been inserted in parentheses, and from the summaries that are given in the discussion.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
March 13, 1920.

The SECRETARY OF THE INTERIOR.

SIR: Pursuant to your direction of a few weeks ago we have given considerable study and consideration to the matter of the existing compensation of registers and receivers and to what, if any, changes are desirable by legislation, in justice to these officers or for the benefit of the service.

At the outset it should be remarked that as a result of piecemeal legislation, and numerous comptroller's and departmental decisions, running through a long period of years, the basis and method of computing compensation of registers and receivers has become complicated and not altogether consistent. In a study of this question we should first note the more general and fundamental propositions that control same.

IN GENERAL.

Omitting a few exceptional cases hereinafter referred to, registers and receivers each receive:

- (a) A salary paid from a governmental appropriation of \$500 per year, and
- (b) An allowance paid from a regular appropriation measured by certain allowable fees and commissions paid either by the Government or the entryman on land entries and selections.

The maximum compensation received by any register or receiver of both salary and commissions shall not exceed \$3,000 per year.

FEES AND COMMISSIONS.

Primarily the fees and commissions for which registers and receivers receive credit on their compensation are those provided by section 2238 of the Revised Statutes. This section provides certain specific fees to be paid registers and receivers for certain specified kinds or classes of land entries or selections, and also provides for a commission to be paid on the purchase price of the land acquired. As to homesteads, it should be noted that a commission is allowed on the cash price of the land if sold at public sale under laws now repealed. No purchase price, as a rule, is actually paid. This commission is collected from the entryman. In case of a straight cash sale, like a town lot, for instance, where the Government actually receives the purchase price, the commission is not collected from the purchaser in addition to the purchase price, but is paid by the Government by appropriation.

Referring to section 2290 of the Revised Statutes (the homestead law), it is there provided that a homestead applicant shall, on the making of certain affidavits and "on payment of \$5 when the entry is of not more than 80 acres and on payment of \$10 when the entry is for more than 80 acres, he or she shall thereupon be permitted to enter the amount of land specified." Such payment is construed as a "fee," as distinguished from commission, but there is nothing in the law that provides for the payment or credit of such fee to the compensation of registers and receivers; hence under the homestead law the entryman pays a commission both on entry and final proof, which is credited to the compensation of registers and receivers, and on making entry he pays a fee which the Government gets, but for which the register and receiver do not get credit on their compensation.

The payment of a "fee" is required in cases of mineral, coal, and timber, and stone entries, but in these instances, under the law as construed and applied, such fees are credited to the compensation of registers and receivers.

Another important feature relative to fees and commissions is that as a rule such moneys are retained by the Government and turned into the Treasury only in those cases where the entry or selection is accepted or allowed; where the entry or selection is rejected, fees and commissions paid with the application or selection are repaid to the entryman or selector. The exceptions to this rule are the fee of \$10 paid by coal and mineral entrymen in each application for patent, the fee of \$2 or \$3 on declaratory statements, the fee of \$1 for notice of cancellation and certain testimony fees. Under the law these fees are construed as "earned," regardless of the action taken on the case. This point is of some little importance in that the Government renders just as much service—in fact, it usually requires more work—in rejecting an application than in its allowance; of course, on the other hand, it may be argued that an applicant should not be required to pay anything on account of an application for land which he can not get.

For more specific information as to fees and commissions in all cases attention is directed to pages 42 to 52, inclusive, of Accounts Circular (No. 616) of this office.

HOW IT WORKS OUT.

As an illustration of the practical working out of the general propositions hereinabove stated, we submit herewith a tabulated statement of the receipts on account of fees and commissions and the compensation of registers and receivers in all local offices for the fiscal year ended June 30, 1919.

EXPLANATION OF TABULATED DATA.

Column A, "Fees and commissions, exclusive of commissions on cash sales": This column means the actual amount of money paid by and collected from entrymen and selectors on account of all classes of entries, hence it does not include any commissions credited to registers and receivers on account of cash sales of public lands or on account of cash sales of Indian lands. (Total, \$1,194,572.10.)

Column B, "Homestead fees, which do not enter into compensation of registers and receivers": This column states the amounts of only the \$5 and \$10 fees above referred to on account of homestead applications. These are the fees which the Government gets, but for which registers and receivers get no credit on their compensation. (Total, \$386,290.)

Column C, "Fees and commissions available for payment of registers and receivers." This column is column A less column B and represents fees and commissions that are credited on compensation of registers and receivers but does not include the commissions which the registers and receivers get on account of cash sales of Indian and public lands. (Total, \$808,282.10.)

Column D, "Two per cent commissions on cash sales of Indian lands": This column is merely for the purpose of segregating the commissions on cash sales of Indian lands from the commissions on other cash sales. The registers and receivers get credit for this 2 per cent in all cases though it is not collected from the entryman; in some cases the amount credited to the registers and receivers comes out of Indian moneys and in some cases out of the Government appropriation, depending upon the provisions of the Indian act under which the sales are made. (Total, \$23,248.01.)

Column E, "Fees and commissions available for payment to registers and receivers, without expense to Government": This is simply column C plus column D. (Total, \$881,530.11.)

Column F, "Two per cent commissions on cash sales of public lands": This represents the cases where the Government actually gets the price and in effect pays the commission out of what it gets. (Total, \$30,281.82.)

Column G, "Total fees and commissions available for payment to registers and receivers from all sources": This includes all fees and commissions, whether collected from the entryman or paid by the Government, which may be credited to compensation of registers and receivers; in other words, it is the sum of columns C, D, and F. (Total, \$861,811.93.)

Column H, "Fees and commissions paid registers and receivers": These are the fees and commissions for which the registers and receivers actually received credit and payment, subject to the limitation of a total compensation of salaries and fees and commissions of not exceeding \$3,000 per year. (Total, \$362,934.)

Column I, "Salaries paid registers and receivers": This explains itself. (Total, \$95,333.32.)

Column J, "Total compensation of registers and receivers": That is to say, salary plus allowable fees and commissions up to the \$3,000 limit. (Total, \$458,267.32.)

Column K, "Excess of fees and commissions (exclusive of homestead fees and commissions on cash sales of public lands) over the amount paid registers and receivers": This represents the fees and commissions actually collected from entrymen which would constitute allowable credit on compensation of registers and receivers were it not for the \$3,000 limitation; hence it does not include the homestead fees. Commissions on sales of Indian lands are included in this column, for the reason that generally they come from Indian moneys and are not a charge on the Government appropriation. (Total, \$437,384.54.)

Column L, "Excess of amount paid registers and receivers over fees and commissions actually earned, including commissions on cash sales of public lands": This column should be considered in connection with column K, for the reason that it shows the wide discrepancy in the earnings and cost of maintenance of the different offices. (Total, \$64,121.75.)

Column L represents the offices in which the Government has to pay out more than it gets, while column K shows the offices and amounts which the Government gets over and above what it has to pay out. Both column K and column L are the difference between column F and column J; where E exceeds J the difference goes in L, and where J exceeds E the difference goes in K.

ANALYSIS OF TABULATED DATA.

From the tabulated statement above described the following facts appear:

1. Of the total of 98 offices therein itemized (4 offices have since been discontinued) 51 are maximum; that is to say, the register and receiver each received compensation on a basis of \$3,000 per year. In 8 offices they received \$2,500 or more, but less than \$3,000; in 10 offices they received \$2,000 or more, but less than \$2,500; in 10 offices they received \$1,500 or more, but less than \$2,000; and in 10 offices they received less than \$1,500.

2. The Government paid a total compensation of salaries, fees, and commissions to all registers and receivers of \$458,267.32, but the Government collected in fees and commissions from entrymen and selectors the sum of \$1,194,572.10, or an excess of \$736,304.78.

3. The Government collected as fees in homestead cases which are not credited on compensation at all the sum of \$886,290.

4. The Government incurred a possible liability for commissions not collected from the purchaser to the extent of \$30,281.82. It is impossible to tell how much of this was an actual liability, because of the \$3,000 limitation. It would necessarily be a total liability only as to minimum offices.

5. Considering only the compensation paid registers and receivers as salaries and allowable fees and commissions, the Government conducted 40 offices at a profit, so to speak, and 58 offices at a loss; the profit in the former being \$437,384.54 and the loss on the latter \$64,121.75. But if homestead fees, not allowable, be included, the Government made a total profit of \$736,304.78, as above stated. It should be remembered, however, that the Government also makes an appropriation for clerk hire and contingent expenses of local land offices; there was paid from this appropriation for such purposes during the fiscal year 1919 the sum of \$322,724.76, exclusive of the current bonus, leaving an approximate net profit to the Government as between total amount paid out for conduct of the offices and total amount of fees and commissions (not purchase price) actually collected from land entrymen, the sum of \$413,580.02.

To avoid confusion or misunderstanding it should be here remarked that in speaking of "profit" in the last preceding paragraph we are referring only to the cost of the conduct of local land offices and not the entire cost of maintenance of the land service; the appropriation for the Washington office, \$672,790; for offices of surveyors general, \$213,860; for field surveying, \$700,000; and for the field service, \$500,000, are not here considered. On the other hand, the above items of income include only fees and commissions and not the purchase price of the lands, nor is any reference made to certain other sources of income from the land service. Considering all items of income and expense, reference to the annual report of this office for the year 1919 shows a gross income from all sources of \$4,303,674.20 and a gross expense of \$3,026,554.46, leaving a net surplus of \$1,277,119.74 of receipts over expenditures.

There is a limited amount which the Government indirectly loses in minimum offices as a result of the operation of the repayment laws, but this amount is so small and indeterminate as to be considered negligible in this connection.

CONSIDERATIONS NOT APPEARING IN TABULATED DATA.

As a result of the enactment of a number of new land laws in which no provision has been made for fees or commissions, there is a considerable amount of business being transacted through local offices, for which service registers and receivers get no credit on their compensation and which service the public gets for nothing. An illustration of this is the act of October 2, 1917 (40 Stat. 297), providing for permits and leases for development of mining of potash. Many applications for permits have been made under this act. They involve large areas and a consequent large amount of work to check and act on same, both in the local offices and in the General Land Office. No substantial reason is seen why the beneficiaries under such a law should not pay a reasonable charge for the service rendered, the same as a homesteader, who as a rule is probably less able to pay than those engaged in the development of potash.

Another material feature is that fees and commissions are paid on which might be considered new business; that is to say, on business which consists of making new filings on the land and final proofs thereon to acquire title. Registers and receivers get no credit on their compensation for giving information or answering thousands of letters of inquiry or making search and examination of records to correct old titles. Neither do they get any credit for the examination of the records and rendering decisions in contest cases. This con-

dition is particularly noticeable in the older offices, or the last office in a State, where the local officers will do a large amount of work in the way of correcting old titles and furnishing the public information for which they get no credit whatever on their compensation. An illustration of this is the land office at Baton Rouge, La., which constantly employs the services of the register and receiver and three clerks, yet the register and receiver received during the fiscal year 1919 a compensation of less than \$2,000 each, whereas Evanston, Wyo., with only one clerk most of the time, is better than maximum; and Miles City, Mont., with six clerks, takes in \$48,916.48 of excess allowable fees and commissions. While good administration requires that all unnecessary offices be abolished, it is also apparent that where it is necessary to maintain these small offices for the benefit of the public and to close up the land business of the State the officers who handle the business are justly entitled to a living compensation.

Still another matter that should not be overlooked in this connection is that of salaries paid clerks in local offices. Up to 1914 we found no difficulty in recruiting this force with stenographers and young land-law clerks at an entrance salary of \$900, and, with a few exceptions, the highest salary now paid is \$1,500, the average for 1919 being \$1,210; and none, outside of Alaska, receives more than \$1,620, with the current bonus added. Under present conditions these salaries are too low to recruit and retain an efficient force in local offices. Principal clerks in local offices must have a wide knowledge of land law and practice, as they are handling all classes of land business, and clerks without experience, except for mere stenographic work, are of little value. The new leasing law will add materially to the work of several local offices.

A very material consideration in this connection is the effect of any change that may be made on the grants to States of 2, 3, and 5 per cent of net proceeds of sales of public lands within their borders and on the reclamation fund.

The so-called 2, 3, and 5 per cent State funds are figures on the moneys actually received from cash sales of public lands after the deduction from the gross proceeds of such sales repayments and the proportionate cost of administration of local offices for the purpose of handling the business connected with such sales, as compared with the total business handled. It is apparent that such rule of computation is more easily stated than carried out. The total amount thus paid for the fiscal year 1918 was \$85,043.47. As new land laws have gradually supplanted cash sales the amount received by the States has gradually decreased. The aggregate paid to all public-land States up to June 30, 1918, amounted to \$16,654,068. The changes hereinafter recommended would have little effect on these grants to the States.

The reclamation fund is made up of the net proceeds from the sale and disposal of public lands, "including the surplus of fees and commissions in excess of allowances to registers and receivers." To determine the net proceeds for this purpose, from the gross proceeds are deducted, first, the amount paid to the States, as per last preceding paragraph; second, repayments; and, third, fees and commissions (not the \$500 salary) in effect actually paid to registers and receivers. Contingent expenses of local land offices are not deducted from the receipts in computing the reclamation fund.

CONCLUSIONS.

The premises considered, it is recommended that legislation be favorably reported to Congress to accomplish the following purposes:

1. That no register or receiver shall receive a total compensation at a rate less than \$2,000 per annum; that is to say, where the salary and allowable fees and commissions amount to less than \$2,000 the difference shall be made up from the appropriation for salaries and commissions of registers and receivers.

2. That the fees paid with homestead applications be credited to the compensation of registers and receivers.

3. That the fees paid with homestead applications be retained by the Government and considered "earned" whether the application is allowed or rejected, except in case of simultaneous applications.

4. That in the case of any application, filing, entry, or selection provided for by law but in which the act providing therefor or other general act makes no provision for any fee or commission, the Commissioner of the General Land Office, with the approval of the Secretary of the Interior, shall be authorized to fix a fee and cause same to be collected, such fee to be retained by the Government and considered as "earned" in all cases, and same to be credited on compensation of registers and receivers.

It will be noted that the above recommendations necessitate certain additional expense to the Government, but also provide for certain additional income, which, of course, raises the question of how the above recommendations would work out in actual practice. Leaving out of consideration the additional fees which the department would be authorized to fix and collect, a close approximation of how the above recommendations would have worked out in actual practice during the fiscal year 1919 is shown in detail in a tabulated statement herewith submitted, which may be summarized as follows:

There would have been an additional income from fees on rejected and withdrawn homestead applications of approximately \$200,000, against which there would have been an additional expense of \$47,566.69, by reason of crediting homestead fees on the compensation of registers and receivers, up to the \$3,000 limit, and of \$21,478.29 by reason of a minimum compensation for registers and receivers of \$2,000 each, a total additional expense of \$69,044.98, leaving a credit balance in favor of the above recommendations of \$130,955.02. But the item of \$200,000 of returned homestead fees and commissions for 1919 is undoubtedly excessive as compared with ordinary years, because of the unusual situation existing as a result of suspended stock-raising applications; hence, to be conservative let us assume that the additional income would only equal the additional expense. These estimates are exclusive of additional cost for clerk hire, as that must be met in any case if local officers are to continue on an efficient basis under existing economic conditions.

Based on the above figures, in 65 offices registers and receivers would have received the maximum compensation of \$3,000 each, as against 51 under the existing method of measuring their compensation; in 6 offices they would have received \$2,500 or more but less than \$3,000, as against 8 offices in which they did receive such amounts; in 9 offices they would have received more than \$2,000 but less than \$2,500, as against 10 offices in which they did receive such amounts; and in 16 offices they would have received the minimum of \$2,000 each, as against 29 offices in which they received less than \$2,000 under existing conditions.

The registers and receivers at the United States land offices at Fairbanks and Nome, Alaska, would not have been affected by the provision for a minimum compensation of \$2,000, as they are but ex officio registers and receivers and receive salaries from other sources.

According to the above figures the reclamation fund would have benefited to the extent of approximately \$162,000, as \$196,000 of the \$200,000 on account of additional fees on homestead applications would have come from the 16 reclamation-fund States, while but \$34,000 would have been charged against the additional amount because of crediting such fees on the compensation of registers and receivers, and if the item of \$200,000 was much reduced the reclamation fund would still be benefited.

CONSOLIDATION OF OFFICES OF REGISTERS AND RECEIVERS.

You have received recent inquiries as to the practicability of consolidating the duties and responsibilities of registers and receivers in one office, with a view to a more economic administration of the land service, if it can be done without impairment of efficiency. The result of such a change is more or less probational and can only be approximated. The register is considered the administrative head of the office and the receiver the fiscal head, though on all affirmative action that is taken on land cases both officers have to act jointly, which results in an office with two heads, which in turn does not always result in harmonious action. Both are bonded officers, and the receivers in the larger offices are responsible for the handling of large sums of money made up of many items, to be accounted for in various ways.

It is believed that the majority of registers and receivers give their full time and best effort to the work of their offices; this means simply that the elimination of one of these officers would necessitate the employment of at least one additional clerk, though perhaps at a somewhat less cost to the Government. In other cases no additional clerk would be required. If this consolidation were made, it would be almost absolutely necessary to provide for a bonded clerk to handle the moneys in the absence of the head officer and to act on official matters in his absence or incapacity. One of the defects of the present system of joint action is that where a vacancy occurs in one of the offices, or one of the officers is incapacitated to act, the whole public-land business in that district, so far as any affirmative action is concerned, is practically all suspended, to the detriment of the service and disadvantage of the public affected. On the whole, I am rather of the opinion that the consolidation of the duties of these officers in one officer would result in a material saving to the Government and in improved efficiency. As registers and receivers are appointed for a term of four years, and are required to reside at the place where their offices are located, and as many of them have doubtless separated themselves from other business and gone to the expense of moving to accept such positions, I do not think the consolidation should be effected in particular cases until the term of at least one of the officers has expired. Moreover, the change would thus be brought about gradually, with less dislocation of the service than if brought about all at once.

I submit herewith a draft of an appropriate bill to carry the above recommendations into effect, and additional section consolidating the offices of register and receiver is also submitted for use if desired.

DRAFT OF PROPOSED BILL.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the fees of five dollars and ten dollars paid with homestead applications under the provisions of section 2290 of the United States Revised Statutes shall be allowed to registers and receivers of the United States land offices as part of their compensation under the same conditions as other fees allowed them by law; and when there is no provision for collecting any fee or commission on an application, filing, entry, or selection provided for by law the Commissioner of the General Land Office, with the approval of the Secretary of the Interior, is hereby authorized to fix a fee and cause same to be collected, which fee shall also be allowed to registers and receivers as part of their compensation: *Provided*, That all fees hereafter paid shall be deposited in the Treasury as earned, and not subject to return or repayment, regardless of the action taken on the application, filing, entry, or selection, except in case of simultaneous applications for the same land, when the fee shall be retained only for the application that is allowed:*

Provided further, That hereafter the compensation of registers and receivers shall be not less than two thousand dollars each per annum, and in cases where such compensation would otherwise be less than two thousand dollars the salary of five hundred dollars now provided by law shall be increased to an amount sufficient to make a total compensation of two thousand dollars.

SEC. 2. Upon the expiration of the term of office of either the register or receiver of a United States land office the President is authorized to abolish the office of receiver of public moneys thereof and to appoint, by and with the advice and consent of the Senate, a register for such office; whereupon all the powers, duties, obligations, and penalties imposed by law upon both the register and receiver of said office shall be exercised by and imposed upon the register, whose compensation shall be a salary of five hundred dollars per annum and all fees and commissions now allowed by law to both register and receiver, but the salary, fees, and commissions of such register shall not exceed three thousand dollars per annum: *Provided*, That when the office of receiver of public moneys of a United States land office is abolished the Commissioner of the General Land Office shall appoint or designate a clerk in such office to act as register in the absence or incapacity of the register or during a vacancy in the office of register.

PERSONNEL AND SALARIES.

Generally speaking, during the past seven years of my administration of this office, I have felt that the responsibility was mine to keep the work of the office up to an acceptable standard of efficiency and to meet the demands of the important public business intrusted to it; for reasons hereinafter stated I can not accept that responsibility, at least not in its entirety, any longer, unless certain existing conditions not under my control are radically changed. I refer to the matter of the statutory salaries in the Washington office of this service. We have now reached a point in this salary situation which, if not immediately adjusted, must inevitably result in the inability of this office to meet the demands placed upon it; if the high-grade part of our force continues to disintegrate during the next few months at the rate it has been going recently, the brains, energy, and experience that make for efficiency in a Government bureau will be gone; except for a few holding the higher positions, we will have left only the ordinary clerical, the mediocre, and the inexperienced; the work will become congested; what is done will not be so well done. The unfortunate results are bound to be felt in every public-land State; development of the greatest consequence may be prevented or delayed.

The legal and technical work of this office is a profession in itself; it can only be learned by experience by those who have the requisite preliminary training, and it can not be learned in a day. One old hand is worth a dozen green clerks; in fact, there are many classes of work that a new clerk, no matter how much education he has, can not do at all.

Now, the statutory grades of this office—lawyers, engineers, draftsmen, stenographers, ordinary clerks, file clerks, everything—consist

of the following: 1, at \$3,000; 1, at \$2,750; 1, at \$2,500; 1, at \$2,400; 2, at \$2,200; 30, at \$2,000; 37, at \$1,800; 75, at \$1,600; 83, at \$1,400; 100, at \$1,200; 121, at \$1,000; 23, at \$900; 2, at \$840; 11, at \$720; 9, at \$660; 10, at \$600; 6, at \$480; total, 513, at \$663,970, an average of \$1,289.42.

Seven years ago it was easy to recruit young law graduates at \$900 and stenographers at \$720. Now we must pay capable stenographers \$1,200 and \$1,400, plus the bonus, places formerly held by law clerks. We are getting a few lawyers at \$1,000 plus the bonus, but we are unable to promote them fast enough to retain them. For the last two years we have had from 20 to 40 vacancies we could not fill with competent people. Some months ago I had occasion to examine some civil-service announcements for examinations for law clerks for various governmental bureaus and departments; they were as follows:

(a) An examination for "claims examiner," Bureau of War Risk Insurance, entrance salary, \$1,800.

(b) "Special agent," Bureau of Internal Revenue, entrance salaries, \$1,500 to \$3,000, with opportunity for promotion to \$3,600.

(c) "Law clerk," Bureau of Naturalization; entrance salary, \$1,400 to \$1,740.

(d) "Special assistant, legal unit," Bureau of Internal Revenue; entrance salary, grade 1, \$1,800 to \$2,250; grade 2, \$2,250 to \$2,750; grade 3, \$2,750 to \$3,500.

(e) "Examiner," Interstate Commerce Commission; entrance salary, \$3,000 to \$5,000 per year.

Compared with the above we were compelled to request the Civil Service Commission to hold an examination for "land-law clerk" for this service at an entrance salary of \$1,000 per year (plus the bonus), with possible promotion to as much as \$1,600, and in a long time promotion to as much as \$2,000. To accentuate the irony of the situation, a lawyer of this office was requested by the Civil Service Commission to pass on the examination papers submitted by the candidates on the examinations above described. In the main, the positions for which these examinations were held require no more ability, the work is no more difficult, and the public interest involved no greater, than that of the higher-grade law clerks in this office; in fact, it is these very positions that our law clerks are leaving us to take, and making good at it. The law prohibits a transfer from a statutory to a lump-sum appropriation at a higher salary within a year, but they accept that handicap because the prospects are better. Let me give a few concrete illustrations of what is happening:

An ordinary adjudicating clerk of this office, at \$1,400, transferred to War Risk at \$1,800.

A law examiner of many years' experience, at \$1,800, resigned to enter private employment at \$4,000.

A very efficient law clerk in the mineral division, who started at the bottom and worked up, thoroughly familiar with office procedure, \$1,600, transferred to Internal Revenue at same salary but better prospects when his year is up.

An efficient law clerk, two years' experience, \$1,400, transferred to Internal Revenue at same salary but better prospects.

An efficient law clerk, \$1,400, transferred to Internal Revenue, now receiving \$2,450.

An efficient law examiner of many years' experience, at \$1,800, transferred to Department of Agriculture at \$2,000 and better prospects.

Capable and experienced accountant, \$1,800, resigned to enter private business at a guaranty equal to former salary and share in profits of business.

Experienced engineer-examiner of surveys, at \$1,600, resigned to accept private position at \$4,000.

An experienced adjudicating clerk, at \$1,400, transferred to Internal Revenue, same salary but better prospects.

A valuable mineral law examiner, many years' experience, \$1,600, transferred to Internal Revenue, same salary but better prospects.

One of the best engineer-examiners of surveys the office has ever had, \$1,800, transferred to Internal Revenue, same salary, promise of \$3,000 at end of year's service; would have received that as entrance salary except for legal inhibition.

An experienced title examiner on lieu-selection work, at \$1,600, to Internal Revenue, field work, at \$1,800.

Law examiner, expert on subject of railroad land grant (there are not a half dozen such in the United States), at \$2,000, resigned to accept appointment in Internal Revenue, same salary and better prospects.

An experienced mineral-law examiner, at \$1,600, transferred to Comptroller's Office, Treasury Department, now receives \$2,400.

Experienced law examiner, State grants, at \$1,600, transferred to Comptroller's Office, now receives \$2,200.

A good file clerk, at \$1,400, transferred to Internal Revenue, now receives, \$4,200.

An expert accountant in supervisory capacity, \$2,000, transferred to Internal Revenue, now receives \$3,600 or more.

Female law examiner, very efficient, \$1,400, transferred to Internal Revenue, now receives \$2,400.

Stenographer-clerk at \$1,400, transferred to Loans and Currency Division, Treasury Department, now receives \$2,200.

An efficient law clerk, several years' experience \$1,400, transferred to Internal Revenue, now receives \$2,500.

Three messengers, two at \$600 and one at \$660, now with Shipping Board at \$2,000, \$2,400, and \$3,500, respectively.

The above are by no means all; they are simply examples of the utterly impossible conditions with which we are confronted in our attempt to conduct the work of a great Government bureau.

The figures and summaries appearing in this report show that the work is here. Nobody familiar with its character, particularly the complications resulting from recent land legislation and policies, will depreciate the labor and ability required to handle it; nobody from a public-land State will underestimate its vital importance. May I not, therefore, enlist your earnest support of measures, which I shall submit with the estimates, corrective of the conditions I have endeavored to make clear?

CLAY TALLMAN,
Commissioner.

The SECRETARY OF THE INTERIOR.

STATISTICS RELATING TO THE DISPOSITION OF THE PUBLIC DOMAIN.

Area of States and Territories.

[Based upon careful joint calculations made in the General Land Office, the Geological Survey, and the Bureau of the Census.]

State or Territory.	Land surface.		Water surface.		Total areas.	
	Sq. miles.	Acres.	Sq. miles.	Acres.	Sq. miles.	Acres.
Alabama.....	51,279	32,818,560	719	460,180	51,998	33,278,720
Arizona.....	113,810	72,838,400	146	93,440	113,956	72,931,840
Arkansas.....	52,535	33,616,000	810	518,400	53,345	34,134,400
California.....	155,652	99,617,280	2,645	1,692,800	158,297	101,310,080
Colorado.....	103,658	66,541,120	800	515,200	104,458	67,056,320
Connecticut.....	4,820	3,084,800	145	92,800	4,965	3,177,600
Delaware.....	1,935	1,257,600	405	259,200	2,370	1,516,800
District of Columbia.....	60	38,400	10	6,400	70	44,800
Florida.....	54,961	35,111,040	3,805	2,435,200	58,766	37,546,240
Georgia.....	58,725	37,584,000	540	345,600	59,265	37,929,600
Idaho.....	53,354	33,346,560	534	341,760	53,888	33,688,320
Illinois.....	56,043	35,867,520	622	398,080	56,665	36,265,600
Indiana.....	36,045	23,068,800	309	197,760	36,354	23,266,560
Iowa.....	55,586	35,575,040	561	359,040	56,147	35,934,080
Kansas.....	81,774	52,335,360	384	245,760	82,158	52,581,120
Kentucky.....	40,131	25,715,540	417	266,880	40,548	25,982,420
Louisiana.....	45,409	29,061,760	3,097	1,982,080	48,506	31,043,840
Maine.....	29,895	19,132,800	3,145	2,012,800	33,040	21,145,600
Maryland.....	9,941	6,362,240	2,386	1,527,040	12,327	7,889,280
Massachusetts.....	8,039	5,144,800	227	145,280	8,266	5,290,080
Michigan.....	57,480	36,787,200	600	320,000	57,980	37,107,200
Minnesota.....	80,858	51,749,120	3,824	2,447,360	84,682	54,196,480
Mississippi.....	46,362	29,671,680	503	321,920	46,865	29,993,600
Missouri.....	68,727	43,968,280	683	443,520	69,410	44,411,800
Montana.....	146,201	93,568,640	796	509,440	146,997	94,078,080
Nebraska.....	76,806	49,157,120	712	455,680	77,518	49,612,800
Nevada.....	109,821	70,285,440	899	566,160	110,720	70,851,600
New Hampshire.....	9,031	5,779,840	310	198,400	9,341	5,978,240
New Jersey.....	7,514	4,808,960	710	454,400	8,224	5,263,360
New Mexico.....	122,503	78,401,920	131	83,840	122,634	78,485,760
New York.....	47,654	30,496,560	1,550	992,000	49,204	31,488,560
North Carolina.....	48,740	31,193,600	3,086	2,359,040	52,426	33,552,640
North Dakota.....	70,183	44,917,120	654	418,560	70,837	45,335,680
Ohio.....	40,740	25,073,600	300	192,000	41,040	26,265,600
Oklahoma.....	69,414	44,424,960	643	411,520	70,057	44,836,480
Oregon.....	95,697	61,188,480	1,062	698,560	96,759	61,887,040
Pennsylvania.....	44,832	28,682,400	294	188,160	45,126	28,870,640
Rhode Island.....	1,067	682,880	181	115,840	1,248	798,720
South Carolina.....	30,485	19,516,800	494	316,160	30,979	19,832,960
South Dakota.....	76,868	49,195,520	747	478,080	77,615	49,673,600
Tennessee.....	41,687	26,679,680	335	214,400	42,022	26,894,080
Texas.....	262,399	167,804,720	3,498	2,238,720	265,896	170,043,440
Utah.....	82,164	52,597,760	2,806	1,795,840	84,980	54,393,600
Vermont.....	9,124	5,639,360	400	251,200	9,524	6,120,800
Virginia.....	40,262	25,767,680	2,365	1,513,600	42,627	27,281,280
Washington.....	66,836	42,775,040	2,291	1,460,240	69,127	44,235,280
West Virginia.....	24,022	15,374,080	145	94,720	24,170	15,468,800
Wisconsin.....	55,256	35,363,840	610	396,800	55,866	35,760,640
Wyoming.....	97,594	62,460,160	320	204,800	97,914	62,664,960
Total.....	2,973,890	1,903,289,600	52,899	33,855,360	3,026,789	1,937,144,960
Alaska.....					590,894	378,165,760
Guam.....					210	134,400
Hawaii.....					6,449	4,127,360
Canal Zone.....					442	282,880
Philippine Islands.....					115,026	73,616,640
Porto Rico.....					3,435	2,198,400
American Samoa.....					77	49,280
Virgin Islands.....					138	88,320

Owing to their location adjoining the Great Lakes, the States enumerated below contain approximately an additional number of square miles as follows: Illinois, 1,674 square miles of Lake Michigan; Indiana, 230 square miles of Lake Michigan; Michigan, 16,663 square miles of Lake Superior, 12,922 square miles of Lake Michigan, 9,925 square miles of Lake Huron, and 460 square miles of Lakes St. Clair and Erie; Minnesota, 2,514 square miles of Lake Superior; New York, 3,140 square miles of Lakes Ontario and Erie; Ohio, 3,443 square miles of Lake Erie; Pennsylvania, 891 square miles of Lake Erie; Wisconsin, 2,378 square miles of Lake Superior and 7,500 square miles of Lake Michigan.

In addition to the water areas noted above, California claims jurisdiction over all Pacific waters lying within 3 English miles of her coast; Oregon claims jurisdiction over a similar strip of the Pacific Ocean 1 marine league in width between latitude 42° north and the mouth of the Columbia River, and Texas claims jurisdiction over a strip of Gulf water 3 leagues in width adjacent to her coast and between the Rio Grande and the Sabine Rivers.

United States district land offices, 95.

Locations.	Established.	Opened.	Locations.	Established.	Opened.
Alabama:			Montana—Contd.		
Montgomery.....	July 10, 1832	Jan. 1, 1834	Helena.....	Mar. 2, 1867	Apr. 27, 1867
Alaska:			Kalspell.....	Mar. 2, 1867	July 1, 1867
Fairbanks.....	May 14, 1907	July 1, 1907	Lewistown.....	Apr. 1, 1880	Nov. 26, 1880
Juneau.....	Apr. 2, 1902	June 20, 1902	Miles City.....	Apr. 30, 1880	Oct. 19, 1880
Nome.....	May 14, 1907	July 1, 1907	Missoula.....	Apr. 1, 1880	Apr. 20, 1891
Arizona:			Nebraska:		
Phoenix.....	July 25, 1906	Oct. 2, 1906	Alliance.....	Apr. 16, 1890	July 1, 1890
Arkansas:			Broken Bow.....	do.....	July 7, 1890
Camden.....	Jan. 10, 1871	Mar. 20, 1871	Lincoln.....	July 7, 1868	Sept. 7, 1868
Harrison.....	July 14, 1870	Feb. 27, 1871	Nevada:		
Little Rock.....	Feb. 17, 1818	Sept. 1, 1821	Carson City.....	July 2, 1862	Mar. 1, 1864
California:			Elko.....	Oct. 3, 1913	Jan. 1, 1914
El Centro.....	June 15, 1916	Sept. 1, 1916	New Mexico:		
Eureka.....	Mar. 29, 1858	July 24, 1858	Clayton.....	Dec. 18, 1888	Aug. 12, 1889
Independence.....	Apr. 22, 1886	Mar. 22, 1887	Fort Sumner.....	June 22, 1910	Oct. 1, 1910
Los Angeles.....	June 12, 1869	Sept. 22, 1869	Las Cruces.....	Mar. 10, 1883	May 1, 1883
Sacramento ¹	July 26, 1866	Nov. 12, 1867	Roswell.....	Mar. 1, 1889	Dec. 9, 1889
San Francisco.....	Mar. 4, 1911	May 1, 1911	Santa Fe.....	May 24, 1858	Nov. 24, 1858
Susansville.....	Feb. 10, 1871	Mar. 2, 1871	Tucumcari.....	Mar. 16, 1908	July 1, 1908
Visalia.....	Mar. 29, 1858	July 10, 1858	North Dakota:		
Colorado:			Bismarck.....	Apr. 24, 1874	Oct. 12, 1874
Del Norte.....	June 20, 1874	Mar. 22, 1875	Dickinson.....	Mar. 16, 1904	July 1, 1904
Denver.....	June 4, 1864	Aug. 15, 1864	Minot.....	Sept. 26, 1880	Oct. 1, 1891
Durango.....	Apr. 20, 1882	Oct. 2, 1882	Williston.....	Apr. 26, 1906	Aug. 1, 1906
Glenwood			Oklahoma:		
Spring.....	July 3, 1884	Nov. 10, 1884	Guthrie.....	Mar. 3, 1889	Apr. 22, 1889
Hugo.....	Feb. 6, 1880	Sept. 7, 1880	Oregon:		
Lamar.....	Aug. 4, 1886	Jan. 3, 1887	Burns.....	June 1, 1889	Sept. 2, 1889
Leadville.....	Apr. 5, 1879	July 1, 1879	La Grande.....	July 3, 1866	Nov. 15, 1867
Montrose.....	Jan. 4, 1888	Sept. 1, 1888	Lakeview.....	June 6, 1877	Aug. 6, 1877
Pueblo.....	May 27, 1870	Jan. 16, 1871	Portland.....	Aug. 24, 1864	Jan. 1, 1865
Sterling.....	Feb. 6, 1890	Aug. 1, 1890	Roseburg.....	Sept. 15, 1869	Jan. 3, 1860
Florida:			The Dalles.....	Jan. 11, 1875	June 1, 1875
Gainesville.....	June 8, 1872	Apr. 30, 1873	Vale.....	Mar. 15, 1910	July 1, 1910
Idaho:			South Dakota:		
Blackfoot.....	Sept. 3, 1886	Nov. 16, 1886	Bellefourche.....	Feb. 6, 1909	July 1, 1909
Boise.....	July 26, 1866	Jan. 13, 1868	Gregory.....	July 14, 1880	Jan. 3, 1882
Coeur d'Alene.....	July 14, 1884	Dec. 21, 1885	Lenmon.....	May 29, 1908	Aug. 1, 1908
Hailey.....	Jan. 24, 1883	July 16, 1883	Pierre.....	Feb. 10, 1890	May 12, 1890
Lewiston.....	July 26, 1866	Sept. 26, 1871	Rapid City.....	Dec. 13, 1888	Jan. 15, 1889
Kansas:			Timber Lake.....	Feb. 12, 1911	May 1, 1911
Dodge City ²	Dec. 20, 1863	Feb. 3, 1864	Utah:		
Topeka.....	July 24, 1861	Sept. 10, 1861	Salt Lake City.....	July 16, 1868	Nov. 1, 1868
Louisiana:			Vernal.....	May 9, 1905	July 1, 1905
Baton Rouge.....	Jan. 6, 1911	Apr. 1, 1911	Washington:		
Michigan:			Seattle.....	June 27, 1887	Dec. 3, 1887
Marquette.....	Mar. 19, 1857	July 14, 1857	Spokane.....	June 23, 1883	Oct. 1, 1883
Minnesota:			Vancouver.....	May 16, 1860	July 3, 1861
Cass Lake.....	Apr. 1, 1903	July 1, 1903	Walla Walla.....	Mar. 8, 1871	July 17, 1871
Crookston.....	Apr. 29, 1878	May 6, 1879	Waterville.....	May 16, 1880	Nov. 6, 1880
Duluth.....	Mar. 27, 1862	Jan. 15, 1863	Yakima.....	Apr. 11, 1885	Apr. 24, 1885
Mississippi:			Wisconsin:		
Jackson.....	June 23, 1836	July 25, 1836	Wausau.....	June 19, 1872	Aug. 19, 1872
Missouri:			Wyoming:		
Springfield.....	June 26, 1834	Oct. 4, 1838	Buffalo.....	Mar. 3, 1887	May 1, 1888
Montana:			Cheyenne.....	Feb. 6, 1870	Aug. 10, 1870
Billings.....	Feb. 5, 1906	July 2, 1906	Douglas.....	Apr. 23, 1880	Nov. 1, 1880
Bosman.....	June 20, 1874	Oct. 5, 1874	Evanston.....	Aug. 9, 1876	Aug. 13, 1877
Glasgow.....	Feb. 25, 1907	June 1, 1907	Lander.....	Apr. 23, 1880	Nov. 8, 1880
Great Falls.....	May 8, 1902	Aug. 1, 1902	Sundance.....	Apr. 3, 1880	Oct. 27, 1880
Havre.....	Mar. 15, 1910	July 1, 1910	Newcastle ³	Dec. 16, 1919	Mar. 1, 1920

¹ Office originally established Jan. 16, 1857, and transferred to Oakland, Calif., following the fire on Apr. 16, 1906.

² Discontinued Aug. 31, 1919.

³ Office moved from Sundance Mar. 1, 1920.

NOTE.—The land offices in Ohio, Indiana, Illinois, and Iowa are abolished, and the vacant tracts of public lands in those States are subject to entry and location at the General Land Office, Washington, D. C.

List of offices of United States surveyors general.

Locations.	Established.	Locations.	Established.
Alaska: Juneau.....	May 17, 1884	New Mexico: Santa Fe.....	Mar. 2, 1867
Arizona: Phoenix.....	Feb. 24, 1863	Oregon: Portland.....	July 17, 1854
California: San Francisco.....	Mar. 3, 1851	South Dakota: Huron.....	Apr. 10, 1880
Colorado: Denver.....	Feb. 28, 1861	Utah: Salt Lake City.....	July 16, 1868
Idaho: Boise.....	June 29, 1866	Washington: Olympia.....	July 17, 1864
Montana: Helena.....	July 2, 1864	Wyoming: Cheyenne.....	Feb. 5, 1870
Nevada: Reno.....	July 4, 1866		

Field division headquarters of special agents of General Land Office.

Field division:

Portland.....	Portland, Oreg.
San Francisco.....	San Francisco, Calif.
Alaskan.....	Juneau, Alaska.
Helena.....	Helena, Mont.
Denver.....	Denver, Colo.
Cheyenne.....	Cheyenne, Wyo.
Southern.....	Jackson, Miss.
Salt Lake City.....	Salt Lake City, Utah.
Santa Fe.....	Santa Fe, N. Mex.

Present organization General Land Office.

- A. Administrative duties. Appointments; bonds of officials, except mineral surveyors; correspondence concerning local officers, surveyors general, etc.; establishment of new land districts, changes in location of district land offices, changes in district boundary lines, discontinuance of local land offices; publication of notices of intention to offer final proof; opening and sale of Indian reservations; printing and binding; bird reservations; leaves of absence; requisitions for supplies; record of attorneys and agents admitted before department and its bureaus, also before district land offices.
- B. Record of patents; use of rectigraph and photostat machines in making photographic copies of papers.
- C. Homesteads, all original, except reclamation; final homesteads; commuted homesteads; homestead declaratory statements; timber and stone entries; public sales, isolated tracts; private sales, lands in Missouri.
- D. Mails and files.
- E. Surveys.
- F. Reclamation work, excepting Minnesota drainage; rights of way; power sites; withdrawals and restorations under the act of June 25, 1910; desert land entries; easements and permits.
- G. Land grants to States and corporations.
- H. Contests.
- K. Indian allotments and Indian homesteads; opening and sale of Indian reservations; preemptions; townsites; military bounty land warrants; abandoned military reservations; agricultural college and other similar scrip; lieu selections; Indian exchange selections; graduation and credit system entries; private land claims; Minnesota drainage entries; Chippewa logging, Minnesota.
- L. Drafting; compilation, engraving, and supervision of publication of United States map for Congress, compilation and revision of State maps, diagrams and miscellaneous maps; custodian of original plats, field notes, and photolithographic copies of township plate.
- M. Accounts; repayments; statistics.
- N. Mineral entries; contests involving character of land; protests in mineral cases; coal, oil, phosphate, and potash withdrawals and restorations; Northern Pacific classification; mineral segregation plats; bonds of mineral surveyors.
- O. Posting, tract books.
- FS. Soldiers' additional homesteads; fraudulent entries; timber trespass; unlawful inclosure public domain; suits to set aside patents; disbarment of attorneys and agents; forest reserve eliminations, restorations, etc.

Average number of employees of the General Land Office, June 30, 1920.

In General Land Office, Washington, D. C.....	498
In 13 offices of surveyors general.....	104
In 94 district land offices.....	209
In the field service.....	120
In the surveying service.....	127
In logging service.....	3
Total.....	1,061

Final homestead entries from passage of homestead act to June 30, 1920.

Fiscal year ended June 30—	Number.	Acres.	Fiscal year ended June 30—	Number.	Acres.
1868.....	2,772	355,096.04	1895.....	20,922	2,980,806.30
1869.....	3,965	504,301.97	1896.....	20,099	2,790,242.55
1870.....	4,041	519,727.84	1897.....	20,115	2,778,404.20
1871.....	5,087	629,162.25	1898.....	22,241	3,065,017.75
1872.....	5,917	707,409.83	1899.....	22,412	3,134,140.44
1873.....	10,311	1,224,890.93	1900.....	25,286	3,477,842.71
1874.....	14,129	1,585,781.56	1901.....	37,568	5,241,120.76
1875.....	18,293	2,084,537.74	1902.....	31,627	4,342,747.70
1876.....	22,530	2,590,552.81	1903.....	26,373	3,576,964.14
1877.....	19,900	2,407,824.19	1904.....	23,932	3,232,716.75
1878.....	22,460	2,662,980.82	1905.....	24,621	3,419,387.15
1879.....	17,391	2,070,842.39	1906.....	25,546	3,526,748.58
1880.....	15,441	1,934,234.89	1907.....	26,485	3,740,567.71
1881.....	15,077	1,924,204.76	1908.....	29,636	4,242,710.59
1882.....	17,174	2,219,453.80	1909.....	25,510	3,699,466.79
1883.....	18,998	2,504,414.51	1910.....	23,253	3,785,862.89
1884.....	21,843	2,945,574.72	1911.....	25,908	4,620,197.12
1885.....	22,066	3,032,679.11	1912.....	24,326	4,306,068.52
1886.....	19,356	2,663,531.83	1913.....	53,252	10,009,235.16
1887.....	19,866	2,749,037.48	1914.....	48,724	9,291,121.46
1888.....	22,413	3,175,400.64	1915.....	37,343	7,180,981.62
1889.....	25,549	3,681,708.80	1916.....	37,958	7,278,280.60
1890.....	28,060	4,060,592.77	1917.....	43,727	8,497,389.68
1891.....	27,686	3,954,587.77	1918.....	41,319	8,236,438.18
1892.....	22,822	3,259,897.07	1919.....	32,623	6,524,759.68
1893.....	24,204	3,477,231.63	1920.....	39,774	8,372,695.79
1894.....	20,544	2,929,947.41			
			Total.....	1,258,935	198,239,567.38

Timber and stone entries from passage of act June 3, 1878, to June 30, 1920.

State or Territory.	Entries.	Acres.	Amount.
Alabama.....	447	32,144.65	\$96,846.61
Arizona.....	25	2,862.80	9,071.07
Arkansas.....	2,318	306,066.56	640,058.77
California.....	20,584	2,852,487.34	7,262,712.17
Colorado.....	3,121	384,070.69	993,889.52
Florida.....	925	104,147.31	290,809.14
Idaho.....	7,481	1,002,194.27	2,612,405.61
Iowa.....	3	119.38	298.40
Louisiana.....	1,607	142,159.78	357,317.76
Michigan.....	1,771	143,859.30	370,802.06
Minnesota.....	12,457	1,395,681.35	3,515,454.22
Mississippi.....	202	13,535.05	46,990.44
Montana.....	5,150	659,430.39	1,711,433.07
Nebraska.....	2	97.33	268.00
Nevada.....	52	6,502.14	16,205.74
North Dakota.....	81	8,646.31	22,005.78
Oklahoma.....	1	40.00	100.00
Oregon.....	26,541	3,767,719.67	9,580,477.46
South Dakota.....	582	63,320.63	163,005.65
Utah.....	29	3,004.66	7,388.92
Washington.....	16,240	2,152,432.91	5,467,996.29
Wisconsin.....	1,098	79,344.37	199,578.00
Wyoming.....	3,734	426,794.51	1,059,948.44
Total.....	104,451	13,546,661.38	34,425,063.12

Desert-land entries from passage of act Mar. 3, 1877, to June 30, 1920.

State or Territory.	Entries.		Acres.		Amount.		Total.
	Original.	Final.	Original.	Final.	Original.	Final.	
Arizona.....	9,227	1,324	2,449,314.35	318,833.84	\$614,846.33	\$350,452.88	\$965,299.21
California.....	23,124	4,588	5,051,718.78	830,203.90	1,279,086.42	852,543.24	2,131,629.66
Colorado.....	17,252	3,799	3,192,967.86	666,154.20	898,778.63	659,857.83	1,558,636.46
Dakota Territory.....	35	1	20,021.00	300.00	5,005.25	300.00	5,305.25
Idaho.....	17,731	4,748	3,018,075.81	939,883.69	755,937.59	892,298.62	1,648,236.21
Montana.....	31,885	14,327	5,954,819.57	2,699,214.52	1,496,250.36	2,694,788.10	4,190,038.46
Nevada.....	2,632	628	571,993.27	124,336.16	133,400.17	123,983.27	257,383.44
New Mexico.....	11,192	1,556	2,149,457.64	226,764.24	539,503.88	325,233.11	864,736.99
North Dakota.....	517	115	85,278.51	19,711.75	21,321.09	19,736.49	41,057.58
Oregon.....	6,483	1,768	1,094,919.55	281,421.70	273,307.58	277,748.17	551,055.75
South Dakota.....	4,069	611	609,170.58	101,601.12	151,887.38	99,288.85	251,170.22
Utah.....	8,021	2,614	1,397,686.98	407,727.34	356,271.60	413,207.99	769,479.59
Washington.....	6,052	653	995,341.68	69,353.44	259,755.43	81,629.40	341,384.83
Wyoming.....	16,798	6,887	5,472,049.80	1,443,998.24	924,919.80	1,448,149.64	2,373,069.44
Total.....	155,018	43,619	32,062,815.38	8,129,504.14	7,709,271.59	8,239,217.50	15,948,489.09

Coal-land entries from passage of act Mar. 3, 1873, to June 30, 1920.

State or Territory.	Entries.	Acres.	Amount.
Alabama.....	2	239.40	2,394.00
Alaska.....	164	38,062.23	380,658.30
Arizona.....	43	6,693.35	74,997.00
California.....	38	5,535.06	81,531.35
Colorado.....	1,055	157,865.12	2,370,026.25
Colorado ¹	447	58,495.65	891,219.55
Dakota Territory.....	8	583.57	5,835.70
Idaho.....	14	3,277.41	35,231.80
Montana.....	497	64,359.50	1,212,516.99
Nevada.....	12	1,341.01	17,242.20
New Mexico.....	225	26,516.01	437,508.95
North Dakota.....	162	9,463.59	149,280.20
Oregon.....	68	10,411.03	123,334.30
South Dakota.....	55	3,583.64	38,964.80
Utah.....	505	73,586.38	2,311,212.15
Washington.....	396	63,704.30	1,020,741.00
Wyoming.....	796	112,820.85	2,805,993.46
Made in General Land Office.....	1	7.95	159.00
Total.....	4,488	638,546.05	11,958,850.00

¹ Within the Ute Indian Reservation.

Timber-culture entries from the passage of the act of Mar. 3, 1879, to June 30, 1880.

State or Territory.	Entries.		Area.		Amount.		
	Original.	Final.	Committed.	Original.	Final.	Committed.	Total.
Arizona.....	1,152	52	74	Acres. 164,806.63	Acres. 7,149.14	Acres. 10,223.14	\$208.00
Arkansas.....	41	4	1	4,817.14	4,890.00	40.00	16.00
California.....	8,284	481	568	1,183,923.03	63,571.58	78,848.76	1,910.00
Colorado.....	27,884	3,789	660	4,332,922.19	586,243.30	98,179.52	15,154.00
Dakota Territory.....	77,446	1,309		12,085,642.98	186,467.24		4,984.79
Florida.....	3			480.00		42.00	
Idaho.....	4,064	341	286	533,957.49	40,436.03	28,244.51	1,366.50
Iowa.....	1,044	380	40	81,378.95	31,867.87	2,330.89	3,013.62
Kansas.....	64,345	12,896	961	9,702,653.36	2,005,831.35	883,275.56	178,560.55
Louisiana.....	64,713	87	42	101,695.31	11,337.97	5,886.85	9,661.55
Minnesota.....	15,268	2,924	389	2,069,046.55	373,580.90	40,261.29	207,154.98
Montana.....	3,595	407	225	486,638.66	56,019.73	29,044.43	46,162.00
Nebraska.....	59,127	16,870	1,260	8,876,351.20	2,546,996.04	187,371.35	813,382.33
Nevada.....	46			6,292.50	160.00		614.00
New Mexico.....	1,612	91	55	280,316.54	12,831.60	7,837.25	21,294.00
North Dakota.....	1,699	7,897	781	283,123.96	1,226,905.66	120,624.80	23,446.00
Oregon.....	7,126	1,502	252	1,051,255.21	224,545.90	35,902.61	96,821.00
South Dakota.....	2,925	13,764	822	449,583.61	2,124,753.63	121,890.98	40,151.00
Utah.....	1,476	138	89	179,690.74	15,558.26	10,157.44	17,925.00
Washington.....	9,354	2,006	538	1,362,193.51	292,727.52	75,689.54	126,615.00
Wisconsin.....	1	1			40.00	9.00	4.00
Wyoming.....	3,123	333	125	459,556.42	50,543.08	15,288.29	41,904.00
Total.....	280,278	65,265	7,108	43,606,344.97	9,856,284.45	1,010,623.81	3,975,281.07
							281,115.88
							1,275,040.26
							5,511,188.80

Land and scrip granted to States and Territories for educational and other purposes.

State or Territory and purpose of grant.	Amount granted.	Total by States.
Alabama:	<i>Acres.</i>	
Tuskegee Normal and Industrial Institute.....	25,000.00	
Industrial school for girls.....	25,000.00	
Seminary of learning.....	46,080.00	
Internal improvements, including river and shoals.....	500,000.00	
Agricultural college scrip.....	240,000.00	
Common schools, section 16.....	911,827.00	
Salt springs and contiguous lands.....	23,040.00	
Seat of government.....	1,620.00	
University.....	46,080.00	
Swamp.....	418,833.53	
Swamp land indemnity.....	20,920.08	
		\$2,258,000.61
Alaska Territory:		
Common schools, sections 16 and 36, reserved (estimated).....	21,009,209.00	
Agricultural College and School of Mines, certain sections 33, reserved (estimated).....	336,000.00	
		21,345,209.00
Arizona:		
University.....	246,080.00	
Public buildings.....	100,000.00	
Penitentiaries.....	100,000.00	
Insane asylums.....	100,000.00	
Deaf, dumb, and blind asylum.....	100,000.00	
Miners' hospital.....	50,000.00	
Normal schools.....	200,000.00	
Charitable, penal, etc.....	100,000.00	
Agricultural and mechanical colleges.....	150,000.00	
School of mines.....	150,000.00	
Military institutes.....	100,000.00	
Payment of bonds issued to Maricopa, Pima, Yavapai, and Coconino Counties.....	1,000,000.00	
Common schools, sections 2, 32, 16, and 36.....	8,083,156.00	
		10,489,236.00
Arkansas:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	10,600.00	
Agricultural college scrip.....	150,000.00	
Common schools, section 16.....	933,778.00	
Salt springs and contiguous lands.....	46,080.00	
Swamp.....	7,686,375.37	
		9,372,913.37
California:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	6,400.00	
Agricultural and mechanical colleges.....	150,000.00	
Common schools, sections 16 and 36.....	5,534,293.00	
Swamp.....	2,152,280.13	
		8,389,053.13
Colorado:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	32,000.00	
Penitentiaries.....	32,000.00	
Agricultural college.....	90,000.00	
Common schools, sections 16 and 36.....	3,685,618.00	
Salt springs and contiguous lands.....	46,080.00	
State agricultural college.....	1,600.00	
		4,433,378.00
Connecticut:		
Agricultural college scrip.....		180,000.00
Delaware:		
Agricultural college scrip.....		90,000.00
Florida:		
Internal improvements.....	500,000.00	
Seminaries of learning.....	92,180.00	
Seat of government.....	5,120.00	
Agricultural college scrip.....	90,000.00	
Common schools, section 16.....	975,307.00	
Swamp.....	20,201,660.52	
Swamp land indemnity.....	94,782.80	
		21,959,030.32
Georgia:		
Agricultural college scrip.....		270,000.00
Idaho:		
Lava hot springs.....	187.30	
University.....	46,080.00	
University, Moscow.....	50,000.00	

Land and scrip granted to States and Territories for educational and other purposes—
Continued.

State or Territory and purpose of grant.	Amount granted.	Total by States.
Idaho—Continued.	<i>Acres.</i>	
Agricultural college.....	90,000.00	
Penitentiary.....	50,000.00	
Public buildings.....	32,000.00	
Insane asylum.....	50,000.00	
Educational, charitable, etc.....	150,000.00	
Normal schools.....	100,000.00	
Scientific schools.....	100,000.00	
Common schools, sections 16 and 36.....	2,963,698.00	
		\$3,631,965.30
Illinois:		
Internal improvements, including canals.....	533,368.24	
Seminary of learning.....	46,080.00	
Seat of government.....	2,560.00	
Agricultural college scrip.....	490,000.00	
Common schools, section 16.....	996,320.00	
Salt springs and contiguous lands.....	121,029.00	
Swamp.....	1,457,399.20	
Swamp land indemnity.....	2,309.07	
		3,639,065.51
Indiana:		
Internal improvements (canals and roads).....	1,916,804.56	
Seminary of learning.....	46,080.00	
Seat of government.....	2,560.00	
Agricultural college scrip.....	390,000.00	
Common schools, section 16.....	668,578.00	
Salt springs and contiguous lands.....	23,040.00	
Swamp.....	1,254,270.73	
Swamp land indemnity.....	4,880.20	
		4,306,213.49
Iowa:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	3,200.00	
Agricultural college.....	240,000.00	
Common schools, section 16.....	988,196.00	
Salt springs and contiguous lands.....	46,080.00	
Swamp.....	873,856.42	
Swamp land indemnity.....	321,978.98	
		3,019,390.40
Kansas:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	6,400.00	
Agricultural college.....	90,000.00	
Do.....	7,682.00	
Common schools, sections 16 and 36.....	2,907,520.00	
Salt springs and contiguous lands.....	46,080.00	
Game preserve.....	3,021.20	
		3,606,783.20
Kentucky:		
Deaf and dumb asylum.....	22,508.65	
Agricultural college scrip.....	330,000.00	
		352,508.65
Louisiana:		
Internal improvements.....	500,000.00	
Seminary of learning.....	46,080.00	
Agricultural college scrip.....	210,000.00	
Common schools, section 16.....	807,271.00	
Swamp.....	9,882,670.83	
Swamp land indemnity.....	32,630.97	
		10,978,652.80
Maine:		
Agricultural college scrip.....		210,000.00
Maryland:		
Agricultural college scrip.....		210,000.00
Massachusetts:		
Agricultural college scrip.....		360,000.00
Michigan:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	3,200.00	
Agricultural college.....	240,000.00	
Common schools, section 16.....	1,021,867.00	
Salt springs and contiguous lands.....	46,080.00	
Swamp.....	5,655,816.13	
Swamp land indemnity.....	24,038.69	
Canals.....	1,250,235.85	
		8,787,317.67

Land and scrip granted to States and Territories for educational and other purposes—
Continued.

State or Territory and purpose of grant.	Amount granted.	Total by States.
Minnesota:	<i>Acres.</i>	
Internal improvements.....	500,000.00	
University.....	92,160.00	
Public buildings.....	6,400.00	
Agricultural college.....	120,000.00	
Experimental forestry.....	20,000.00	
Public park.....	5,592.51	
Common schools, sections 16 and 36.....	2,874,851.00	
Salt springs and contiguous lands.....	46,080.00	
Swamp.....	4,662,967.10	
		\$8,330,950.61
Mississippi:		
Internal improvements.....	500,000.00	
Seminary of learning.....	69,120.00	
Seat of government.....	1,253.16	
Agricultural college scrip.....	210,000.00	
Common schools, section 16.....	824,213.00	
Swamp.....	3,285,906.65	
Swamp land indemnity.....	56,781.76	
		4,947,274.57
Missouri:		
Internal improvements.....	500,000.00	
Seminary of learning.....	46,080.00	
Seat of government.....	2,560.00	
Agricultural college.....	330,000.00	
Common schools, section 16.....	1,221,513.00	
Salt springs and contiguous lands.....	46,080.00	
Swamp.....	3,346,683.70	
Swamp land indemnity.....	81,016.69	
		5,574,233.39
Montana:		
University.....	46,080.00	
Agricultural college.....	140,000.00	
Public buildings.....	182,000.00	
Deaf and dumb asylum.....	50,000.00	
Reform school.....	50,000.00	
School of mines.....	100,000.00	
Normal schools.....	100,000.00	
Militia camp.....	640.00	
Observatory for university.....	480.00	
Biological station.....	180.00	
Common schools, sections 16 and 36.....	5,198,258.00	
Fort Assiniboine, for educational institutions.....	2,000.00	
		5,869,618.00
Nebraska:		
Penitentiary.....	32,000.00	
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	12,800.00	
Agricultural college.....	90,000.00	
Common schools, sections 16 and 36.....	2,730,951.00	
Salt springs and contiguous lands.....	46,080.00	
Dry-land agricultural experiments.....	800.00	
		3,458,711.00
Nevada:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Penitentiary.....	12,800.00	
Public buildings.....	12,800.00	
Mining and mechanic arts.....	90,000.00	
Common schools, sections 16 and 36, and lieu lands, act June 16, 1890.....	2,061,967.00	
		2,723,647.00
New Hampshire:		
Agricultural college scrip.....		150,000.00
New Jersey:		
Agricultural college scrip.....		210,000.00
New Mexico (act June 21, 1898):		
University.....	111,080.00	
Saline land (university).....	1,622.86	
Agricultural college.....	100,000.00	
Improvement of Rio Grande.....	100,000.00	
Penitentiary.....	50,000.00	
Public buildings.....	32,000.00	
Insane asylum.....	50,000.00	
Deaf and dumb asylum.....	50,000.00	
Reform school.....	50,000.00	
Normal schools.....	100,000.00	
School of mines.....	50,000.00	
Blind asylum.....	50,000.00	

Land and scrip granted to States and Territories for educational and other purposes—Continued.

State or Territory and purpose of grant.	Amount granted.	Total by States.
New Mexico (Act June 21, 1898)—Continued.	<i>Acres.</i>	
Reservoirs.....	500,000.00	
Miners' hospital.....	50,000.00	
Military institute.....	50,000.00	
Common schools, sections 16 and 36.....	4,355,662.00	
		\$5,700,364.88
New Mexico (act June 20, 1910):		
University.....	200,000.00	
Public buildings.....	100,000.00	
Insane asylums.....	100,000.00	
Penitentiaries.....	100,000.00	
Deaf, dumb, and blind asylum.....	100,000.00	
Miners' hospitals.....	50,000.00	
Normal schools.....	200,000.00	
Charitable, penal, and reformatory.....	100,000.00	
Agricultural and mechanical colleges.....	150,000.00	
School of mines.....	150,000.00	
Military institutes.....	100,000.00	
Payment of bonds issued by Grant and Santa Fe Counties.....	1,000,000.00	
Common schools, sections 2 and 32.....	4,355,662.00	
		6,705,662.00
New York:		
Agricultural college scrip.....		990,000.00
North Carolina:		
Agricultural college scrip.....		270,000.00
North Dakota:		
University.....	86,060.00	
Agricultural college.....	130,000.00	
Public buildings.....	82,000.00	
Educational, charitable, etc.....	170,000.00	
Deaf and dumb asylum.....	40,000.00	
Reform school.....	40,000.00	
School of mines.....	40,000.00	
Normal school.....	80,000.00	
Common schools, sections 16 and 36.....	2,495,396.00	
		3,163,476.00
Ohio:		
Internal improvements (canals and roads).....	1,019,071.88	
Seminaries of learning.....	69,120.00	
Agricultural college scrip.....	630,000.00	
Common schools, section 16.....	724,266.00	
Salt springs and contiguous lands.....	24,216.00	
Swamp.....	26,251.95	
		2,492,925.93
Oklahoma:		
Normal schools.....	300,000.00	
Oklahoma University.....	250,000.00	
University preparatory school.....	150,000.00	
Agricultural and mechanical college.....	250,000.00	
Colored agricultural and normal university.....	100,000.00	
Common schools, sections 16 and 36.....	1,375,000.00	
Certain sections, 13 and 33.....	669,000.00	
Insane asylum.....	1,760.25	
		3,095,760.25
Oregon:		
Internal improvements.....	500,000.00	
University.....	46,080.00	
Public buildings.....	6,400.00	
Agricultural college.....	90,000.00	
Common schools, sections 16 and 36.....	3,399,360.00	
Salt springs and contiguous lands.....	46,080.00	
Public park (area not yet determined).....		
Swamp.....	264,069.01	
		4,351,989.01
Pennsylvania:		
Agricultural college scrip.....		780,000.00
Rhode Island:		
Agricultural college scrip.....		120,000.00
South Carolina:		
Agricultural college scrip.....		180,000.00
South Dakota:		
University.....	86,080.00	
Agricultural college.....	180,000.00	
Public buildings.....	82,000.00	
Educational and charitable.....	170,000.00	
Deaf and dumb asylum.....	40,000.00	
Reform school.....	40,000.00	
School of mines.....	40,000.00	

Land and scrip granted to States and Territories for educational and other purposes—
Continued.

State or Territory and purpose of grant.	Amount granted.	Total by States.
South Dakota—Continued.	<i>Acres.</i>	
Normal schools.....	80,000.00	
Missionary work.....	160.00	
Military camp ground.....	640.00	
Insane asylum.....	640.00	
Common schools, sections 16 and 36.....	2,733,084.00	
		\$3,432,604.00
Tennessee:		
Agricultural college scrip.....		300,000.00
Texas:		
Agricultural college scrip.....		180,000.00
Utah:		
University.....	156,080.00	
Agricultural college.....	200,000.00	
Public buildings.....	64,000.00	
Insane asylum.....	100,000.00	
Deaf and dumb asylum.....	100,000.00	
Reform school.....	100,000.00	
School of mines.....	100,000.00	
Normal schools.....	100,000.00	
Blind asylum.....	100,000.00	
Reservoirs.....	500,000.00	
Miners' hospital.....	50,000.00	
Common schools, sections 2, 16, 32, and 36.....	5,844,196.00	
		7,414,276.00
Vermont:		
Agricultural college scrip.....		150,000.00
Virginia:		
Agricultural college scrip.....		300,000.00
Washington:		
University.....	46,080.00	
Agricultural college.....	90,000.00	
Public buildings.....	132,000.00	
Educational and charitable.....	200,000.00	
Normal schools.....	100,000.00	
Scientific schools.....	100,000.00	
Common schools, sections 16 and 36.....	2,376,391.00	
		3,044,471.00
West Virginia:		
Agricultural college scrip.....		150,000.00
Wisconsin:		
Canal.....	338,626.97	
River improvement.....	683,722.43	
Internal improvements.....	500,000.00	
University.....	92,160.00	
Public buildings.....	6,400.00	
Agricultural college.....	240,000.00	
Forestry.....	20,000.00	
Common schools, section 16.....	982,329.00	
Swamp.....	3,251,563.94	
Swamp-land indemnity.....	105,047.99	
		6,219,850.33
Wyoming:		
University.....	46,080.00	
Agricultural college.....	90,000.00	
Public buildings.....	107,000.00	
Penitentiary.....	30,000.00	
Insane asylum.....	30,000.00	
Educational, penal, etc.....	290,000.00	
Deaf and dumb asylum.....	30,000.00	
Miners' hospital.....	30,000.00	
Fish hatcheries.....	5,480.00	
Poor farm.....	10,000.00	
Common schools, sections 16 and 36.....	3,470,009.00	
		4,138,569.00
Grand total.....		202,333,099.40

Lands patented or certified under concessions by act of Congress to States and corporations for railroad and military wagon-road purposes from the year 1850 to June 30, 1920.

STATE GRANTS.

	Acres.
Illinois:	
Illinois Central.....	2, 595, 133. 00
Mississippi:	
Mobile & Ohio River.....	737, 130. 29
Vicksburg & Meridian.....	199, 101. 51
Gulf & Ship Island.....	139, 113. 32
Total.....	1, 075, 345. 02
Alabama:	
Mobile & Ohio.....	¹ 419, 528. 44
Alabama & Florida.....	399, 022. 84
Selma, Rome & Dalton.....	458, 555. 82
Cocoa & Tennessee.....	67, 784. 96
Mobile & Girard.....	² 302, 181. 16
Alabama & Chattanooga.....	654, 009. 12
South & North Alabama.....	445, 478. 47
Total.....	2, 746, 560. 81
Florida:	
Florida Central & Peninsular.....	741, 668. 27
Florida & Alabama.....	166, 691. 08
Pensacola & Georgia.....	1, 279, 236. 70
Florida, Atlantic & Gulf Central.....	29, 384. 18
Total.....	2, 216, 980. 23
Louisiana:	
Vicksburg, Shreveport & Pacific.....	372, 092. 34
New Orleans, Opelousas & Great Western.....	(³)
Arkansas:	
St. Louis, Iron Mountain & Southern.....	1, 325, 355. 46
Little Rock & Fort Smith.....	1, 052, 082. 51
Memphis & Little Rock.....	184, 657. 33
Total.....	2, 562, 095. 30
Missouri:	
Southwest branch of the Pacific road.....	1, 161, 284. 51
Hannibal & St. Joseph.....	611, 323. 35
St. Louis, Iron Mountain & Southern.....	65, 360. 31
Total.....	1, 837, 968. 17
Iowa:	
Burlington & Missouri River.....	389, 990. 11
Chicago, Rock Island & Pacific.....	⁴ 483, 214. 36
Cedar Rapids & Missouri River.....	161, 532. 81
Dubuque & Sioux City.....	⁴ 922, 824. 85
Iowa Falls & Sioux City.....	244, 022. 96
	⁴ 556, 406. 74
	683, 057. 34

¹ In the adjustment of this grant the road was treated as an entirety and without reference to the State line: hence Alabama has had approved to her more and Mississippi less than they would appear to be entitled to in proportion to the length of the road in the respective States.

² This grant was adjusted by pr. 24, 1893, and 302,181.16 acres were allotted to the company. The balance of the previously certified lands were ordered restored to entry under the forfeiture act of Sept. 29, 1890.

³ Certified lands footing 719,189.79 acres were reconveyed to the United States by the governor of Louisiana Feb. 24, 1888, the grant having been forfeited by the act of July 14, 1870 (16 Stat., 277).

⁴ Includes 35,685.49 acres of the Chicago, Rock Island & Pacific R. R.; 109,756.85 acres of the Cedar Rapids & Missouri River R. R.; and 77,535.32 acres of the Dubuque & Sioux City R. R., situated in the old Des Moines River grant of Aug. 8, 1846, which should be deducted from the foregoing amount. (Wolcott v. Des Moines Co., 5 Wall., 631.)

Iowa—Continued.

	Acres.
Des Moines Valley (river-improvement grant).....	840, 171. 36
Chicago, Milwaukee & St. Paul.....	326, 216. 10
McGregor & Missouri River.....	
Sioux City & St. Paul.....	
Total.....	4, 929, 849. 44

Michigan:

Port Huron & Lake Michigan.....	37, 467. 44
Jackson, Lansing & Saginaw.....	743, 787. 58
Grand Rapids & Indiana.....	852, 521. 10
Flint & Pierre Marquette.....	512, 932. 38
Marquette, Houghton & Ontonagon.....	305, 929. 59
Ontonagon & Brule River.....	34, 227. 08
Bay de Noquet & Marquette.....	128, 301. 05
Chicago & North Western.....	518, 065. 36
Total.....	3, 133, 231. 58

Wisconsin:

Chicago, St. Paul, Minneapolis & Omaha (formerly West Wisconsin).....	813, 706. 71
Wisconsin Railroad Farm Mortgage Land Co.....	163, 159. 65
Chicago, St. Paul, Minneapolis & Omaha (formerly St. Croix & Lake Superior).....	816, 487. 76
Branch to Bayfield.....	471, 721. 14
Chicago & North Western.....	546, 446. 20
Wisconsin Central.....	838, 347. 69
Total.....	3, 649, 869. 15

Minnesota:

St. Paul, Minneapolis & Manitoba (formerly first division St. Paul & Pacific).....	3, 262, 205. 18
Western R. R. (succeeded by St. Paul & Northern Pacific R. R. Co.).....	
St. Paul, Minneapolis & Manitoba (formerly St. Vincent extension of the St. Paul & Pacific).....	
Minnesota Central.....	179, 734. 29
Winona & St. Peter.....	1, 680, 974. 92
St. Paul & Sioux City.....	1, 126, 618. 55
St. Paul & Duluth.....	860, 983. 08
Southern Minnesota, from a point on the Mississippi River to Houston.....	546, 745. 44
Southern Minnesota extension (now Chicago, Milwaukee & St. Paul).....	
Hastings & Dakota.....	377, 776. 15
Total.....	8, 035, 037. 61

Minnesota, North Dakota, Montana, and Washington:

St. Paul, Minneapolis & Manitoba, now Great Northern (main and branch), a special act (Aug. 5, 1892, 27 Stat. L., 390) to provide for indemnity for lands relinquished by the company.....	(7)
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* Excess of 131,481.71 acres originally certified under this grant reconveyed by State or entered under act Mar. 3, 1887, by Michigan Land & Iron Co. (Ltd.), grant having been forfeited in part by act Mar. 2, 1890 (25 Stat., 1008).

* Declared to be one grant (see 32 L. D., 21).

† See Minnesota for original grants.

Kansas:	Acres.
Leavenworth, Lawrence & Galveston.....	249, 446. 13
Missouri, Kansas & Texas.....	976, 593. 22
Atchison, Topeka & Santa Fe.....	2, 944, 788. 14
St. Joseph & Denver City.....	462, 933. 24
Total.....	4, 633, 760. 73
Grand total.....	37, 787, 923. 38

CORPORATION GRANTS.

Union Pacific.....	11, 934, 401. 46
Central Pacific.....	6, 492, 486. 10
Central Pacific (successor by consolidation with Western Pacific).....	458, 786. 66
Central Branch, Union Pacific.....	223, 080. 50
Union Pacific (Kansas division).....	6, 175, 660. 63
Union Pacific (successor to Denver Pacific Ry. Co.).....	807, 564. 76
Burlington & Missouri River in Nebraska.....	2, 374, 090. 77
Sioux City & Pacific (now Missouri Valley Land Co.).....	42, 610. 95
Northern Pacific.....	38, 411, 862. 01
Oregon branch of the Central Pacific (California & Oregon).....	3, 161, 465. 34
Oregon & California.....	2, 777, 521. 04
Atlantic & Pacific (now Santa Fe Pacific).....	7, 336, 931. 46
Southern Pacific (main line).....	4, 092, 846. 00
Southern Pacific (branch line).....	1, 646, 778. 74
Oregon Central.....	128, 618. 13
New Orleans Pacific.....	1, 001, 943. 40
Grand total.....	87, 066, 647. 95

WAGON ROADS.

From Lake Erie to Connecticut Western Reserve.....	80, 773. 54
From Lake Michigan to Ohio River.....	170, 580. 24
From Fort Wilkins, Copper Harbor, Mich., to Green Bay, Wis.....	302, 930. 96
From Fort Wilkins, Copper Harbor, Mich., to Wisconsin State line.....	221, 013. 35
Oregon Central Military Co. (now California & Oregon Land Co.).....	859, 937. 29
Corvallis and Yaquina Bay.....	83, 716. 76
Willamette Valley and Cascade Mountain.....	861, 511. 86
Dalles Military Road.....	573, 799. 77
Coos Bay Military Road.....	105, 240. 11
Grand total.....	3, 259, 503. 88

* Includes 186,936.72 acres of the "Osage ceded reservation," which are to be deducted from the above amount under the decision of the Supreme Court in the case of the Leavenworth, Lawrence & Galveston R. R. v. The United States (92 U. D., 738).

* Includes 270,970.78 acres in the "Osage ceded reservation," which are to be deducted under the decision cited in note 8.

Lands certified or patented on account of railroad and wagon road grants during the fiscal year ended June 30, 1920.

Grant.	State.	Area.
State grants:		<i>Acres.</i>
St. Paul, Minneapolis & Manitoba, now Great Northern Ry. Co.	Minnesota.....	47.00
Do.....	North Dakota.....	14.10
Do.....	Washington.....	2,880.24
Total.....		2,941.34
St. Paul & Duluth.....	Minnesota.....	9.46
Wisconsin Central.....	Wisconsin.....	120.00
Total State grants.....		3,070.80
Corporations:		
Atlantic & Pacific, now Santa Fe Pacific R. R. Co.	Arizona.....	9,566.62
Do.....	New Mexico.....	6,227.03
Central Pacific R. R. Co.	California.....	1,070.39
Do.....	Nevada.....	42,872.14
Do.....	Utah.....	1,908.50
Northern Pacific Ry. Co.	Idaho.....	10,226.52
Do.....	Montana.....	311,103.35
Do.....	Oregon.....	2,752.82
Do.....	Washington.....	12,300.02
Oregon & California R. R. Co. ¹	Oregon.....	1,350.49
Southern Pacific (main line)	California.....	44,084.04
Southern Pacific (branch line)	do.....	63,473.93
Union Pacific R. R. Co.	Colorado.....	160.00
Do.....	Utah.....	154.07
Do.....	Wyoming.....	40.00
Total.....		507,239.92
Wagon road grants:		
California & Oregon Land Co.	Oregon.....	357.40
The Dalles Military Road Co.	do.....	16,972.73
Total.....		17,330.13
Grand total.....		527,640.85

¹ The tracts patented under this grant were sold by the company to purchasers prior to July 1, 1913, the date fixed in the revetment act of June 9, 1916 (39 Stat., 218).

Total certified or patented during the year.....	527,640.85
Total canceled during the year.....	28,599.98

Total disposed of during the year.....	556,240.83
Total received during year.....	1,710,915.82

State grants, fiscal year ended June 30, 1920.

Kind of selection.	Pending and received.			Disposed of.			Pending June 30, 1920.
	Pending July 1, 1919.	Since received.	Total.	Approved.	Can-celed.	Total.	
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Swamp.....	103,639.01	2,871.10	106,510.11	13,710.38	29,996.04	43,706.42	62,803.69
School indemnity.....	3,199,794.15	587,723.93	3,787,518.08	1,317,009.98	38,433.61	1,355,443.59	2,412,112.49
University.....	45,037.95	364.34	45,402.31	10,035.21	13.50	10,048.71	35,353.60
Agricultural and mechanical colleges.....	26,285.37	2,320.00	28,605.37	1,709.37		1,709.37	26,896.00
Penitentiaries.....	9,421.31		9,421.31	5,934.48		5,934.48	3,486.83
Public buildings.....	19,331.74	1,320.00	20,651.74	5,942.70	184.90	6,127.60	14,524.06
Insane asylums.....	8,318.67		8,318.67				8,318.67
Educational, charitable, penal, and reformatory institutions.....	13,485.03	9,887.00	23,372.63	6,437.64	200.00	6,637.64	16,734.99
Deaf, dumb, and blind asylums.....	2,476.91	438.93	2,915.84	480.00		480.00	2,435.84
Normal schools.....	55,879.05	1,424.72	57,303.77	14,757.17	2,134.23	16,891.40	40,414.37
School of mines.....	13,613.90		13,613.90	1,520.00	160.00	1,680.00	11,933.90
Miners' hospitals.....	6,141.04		6,141.04	5,002.09		5,002.09	1,138.95
Military institutes.....	46,183.44	480.52	46,663.96	19,111.02	400.00	19,511.02	27,152.94
Bonds issued by Santa Fe and Grant Counties.....	49,952.00	4,599.90	54,551.90	32,871.42	1,407.60	34,279.02	20,272.88
Bonds issued by Maricopa, Pima, etc., Counties.....	189,417.98	6,737.64	196,155.62	63,750.22		63,750.22	132,405.40
Public park.....	1,272.50		1,272.50				1,272.50
Reform school.....	141.06		141.06				141.06
Internal improvements.....		200.00	200.00		200.00	200.00	
Total specific grants.....	486,957.97	27,775.67	514,733.64	167,751.92	4,700.29	172,452.21	342,281.43
Grand total.....	3,790,391.13	618,410.70	4,408,801.83	1,498,472.26	93,131.94	1,591,604.22	2,817,197.61

State grants—Recapitulation.

State.	Swamp confirmed.	School indemnity confirmed.	Other grants confirmed.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....		348,544.08	125,193.27
Arkansas.....	40.00		
California.....	11,614.94	23,210.07	
Colorado.....		5,627.42	
Florida.....		99.05	
Idaho.....		120,905.30	
Louisiana.....	2,101.24	225.85	
Michigan.....	6.57		
Mississippi.....	47.63		
Montana.....		109,943.10	
New Mexico.....		584,690.16	39,073.98
South Dakota.....		7,189.48	
Utah.....		22,891.12	
Washington.....		77,983.80	
Wyoming.....		15,700.55	3,484.67
Total.....	13,710.38	1,317,009.98	167,751.92

Withdrawals under the act of Mar. 15, 1910 (36 Stat., 237), during the fiscal year ended June 30, 1920.

State.	Pending July 1, 1919.	Applied for 1919-1920.	Rejected before with- drawal, 1919-1920.	Pending July 1, 1920.	Remaining withdrawn July 1, 1919.	Restored 1919-1920.	Remaining withdrawn July 1, 1920.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	14,251.17			14,251.17	18,240.00	18,240.00	29,708.15
Colorado.....	21,164.77		21,164.77		21,164.77	21,164.77	
Idaho.....							
Montana.....							
Nevada.....							
New Mexico.....							
Oregon.....	909.91	16,862.19		17,772.10	75,497.64	31,742.59	43,755.05
Utah.....							
Wyoming.....	2,800.00	17,630.34		20,430.34	20,854.43	480.00	20,374.43
Total.....	39,125.85	34,492.53	21,164.77	52,453.61	165,464.99	71,627.36	93,837.63

Withdrawals under the act of March 15, 1910 (36 Stat., 237) from the passage of the act to June 30, 1920.

State.	Applied for.	Rejected before withdrawal.	Withdrawn.	Restored.	Remaining withdrawn.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	33,270.76		33,270.76	33,270.76	
Colorado.....	1,044,846.19	354,276.73	676,318.29	646,610.14	29,708.15
Idaho.....	629,501.61	283,255.80	346,245.81	346,245.81	
Montana.....	118,064.07	77,056.57	41,007.50	41,007.50	
Nevada.....	1,160,074.59	481,023.22	679,051.37	679,051.37	
New Mexico.....	383,951.62	368,090.02	15,861.60	15,861.60	
Oregon.....	463,332.32	208,607.30	236,952.92	193,197.87	43,755.05
Utah.....	697,917.28	334,607.97	363,309.31	363,309.31	
Wyoming.....	382,832.98	211,768.02	150,634.62	130,260.19	20,374.43
Total.....	4,913,791.42	2,318,685.63	2,542,652.18	2,448,814.55	93,837.63

State desert-land segregations under section 4 of the act of August 18, 1894, (28 Stat., 372-422), and the acts amendatory thereof, commonly designated as the Carey Act, and the action taken thereon during the fiscal year ended June 30, 1920.

State.	Pending July 1, 1919.	Applied for 1919-20.	Rejected be- fore segrega- tion 1919-20.	Pending July 1, 1920.	Remaining segregated July 1, 1919.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	10,913.35	17,321.14		28,234.49	
Colorado.....	44,615.95			44,615.95	182,309.00
Idaho.....	19,871.92	554,258.19		574,130.11	456,080.12
Montana.....	33,913.92			16,188.79	82,830.70
Nevada.....	5,440.00			5,440.00	12,246.02
New Mexico.....					7,564.68
Oregon.....	95,427.07			95,427.07	224,672.09
Utah.....	183,533.73			183,533.73	59,854.59
Wyoming.....	109,659.21	4,763.31		109,462.89	921,200.09
Total.....	503,375.15	576,342.64		1,057,033.03	1,946,757.29

State.	Segregated 1919-20.	Canceled 1919-20.	Patented 1919-20.	Time to reclaim extended.	Remaining segregated July 1, 1920.
Arizona.....					151,674.71
Colorado.....		30,634.29			444,169.47
Idaho.....		6,863.46	5,047.32		99,882.44
Montana.....	17,725.13	673.39			12,246.02
Nevada.....					7,564.68
New Mexico.....					224,672.09
Oregon.....					59,694.59
Utah.....		160.00			600,838.50
Wyoming.....	4,959.63	324,841.22	480.00	24,863.57	
Total.....	22,684.76	363,172.36	5,527.32	24,863.57	1,600,740.37

State desert-land segregations under section 4 of the act of Aug. 18, 1894 (28 Stat., 372-422), and the acts amendatory thereof, commonly designated as the Carey Act, with the action thereon from the passage of the act to June 30, 1920.

States.	Applied for.	Rejected before seg-regation.	Segregated.	Canceled.	Patented.	Recon-veyed.	Time to reclaim extended.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	31,226.30	2,991.81	284,653.97	119,676.80	13,302.46		
Colorado.....	460,431.06	131,161.14	1,321,454.92	321,209.68	556,075.90		
Idaho.....	3,805,528.67	1,909,943.64	246,698.97	80,550.20	66,266.33	10,104.03	62,584.96
Montana.....	609,826.46	346,938.70	36,808.59	24,562.56			
Nevada.....	185,445.85	143,197.26	7,564.68				
New Mexico.....	10,164.68	2,600.00	387,078.30	105,702.36	62,718.34	6,014.49	140,740.90
Oregon.....	791,615.27	309,109.90	141,814.94	56,306.70	25,814.65		
Utah.....	606,704.00	281,355.33	1,356,575.16	590,121.51	164,615.15	4,467.23	267,578.08
Washington.....	155,649.39	155,649.39					
Wyoming.....	1,717,381.75	252,343.70					
Total.....	8,373,973.43	3,535,290.87	3,781,649.53	1,298,128.82	888,792.83	20,575.95	460,898.93

Withdrawals and restorations.

COAL LAND.

State.	Withdrawals outstanding June 30, 1919.	Fiscal year ended June 30, 1920; restorations.	Withdrawals outstanding June 30, 1920.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Arizona.....	141,945		141,945
California.....	17,643		17,643
Colorado.....	4,496,376	7,004	4,491,372
Idaho.....	4,761		4,761
Montana.....	10,612,112	1,906	10,610,206
Nevada.....	83,833		83,833
New Mexico.....	5,586,244		5,586,244
North Dakota.....	14,232,501	516,176	13,716,325
Oregon.....	4,361		4,361
Utah.....	5,314,075		5,314,075
Washington.....	824,074	640	823,434
Wyoming.....	2,437,563		2,437,563
Total.....	43,757,488	525,726	43,231,762

OIL LANDS.

Arizona.....	230,400		230,400
California.....	1,257,229		1,257,229
Colorado.....	87,474		87,474
Louisiana.....	467,030		467,030
Montana.....	1,346,105	954	1,345,151
North Dakota.....	84,894		84,894
Utah.....	1,962,787		1,962,787
Wyoming.....	1,083,900		1,083,900
Total.....	6,519,819	954	6,518,865

PHOSPHATE LAND.

Florida.....	119,737		119,737
Idaho.....	1,015,717		1,015,717
Montana.....	287,883		287,883
Utah.....	302,465		302,465
Wyoming.....	998,592		998,592
Total.....	2,724,394		2,724,394

Report of withdrawals made under the act of June 25, 1910 (36 Stat., 847), as amended by the act of Aug. 24, 1912 (37 Stat., 497), and the restorations therefrom, from July 1, 1919, to June 30, 1920.

WITHDRAWALS FOR AND RESTORATIONS FROM POWER SITE RESERVES.

States.	Public water withdrawals.			Public water restorations.				
	Num-ber.	Date of appro- val.	Area.	Num-ber.	Date of appro- val.	Area.	Outstanding	
							July 1, 1919.	June 30, 1920.
			<i>Acres.</i>			<i>Acres.</i>		
Alabama.....			10,000				120	120
Alaska.....	726	Dec. 6, 1919					81,015	91,015
Arkansas.....							22,354	22,354
Arizona.....	717 749	May 17, 1919 May 7, 1920	110 6,360				295,738	302,208
			6,470					
California.....	705 710 722 712 729 732 738 740 723 746	Aug. 22, 1919 do Aug. 25, 1919 Sept. 29, 1919 Dec. 27, 1919 do May 14, 1920 May 21, 1920 Dec. 9, 1919 June 17, 1920	770 300 2,280 80 40 198 8 80 127 80				288,894	292,857
			3,963					
Colorado.....	715 721	Mar. 25, 1919 July 11, 1919	80 11,991	284 285	July 11, 1919 Aug. 29, 1919	19,036 3,757	277,056	266,334
			12,071			22,793		
Idaho.....	720 724 725	July 20, 1919 Dec. 6, 1919 do	321 662 942	285 286 306 207	Aug. 29, 1919 Sept. 3, 1919 May 27, 1920 June 8, 1920	1,033 160 813 1	258,473	258,391
			1,925					
						2,007		
Michigan.....							1,240	1,240
Minnesota.....							12,309	12,309
Montana.....	734 736	May 14, 1920 do	127 21	283 282 286	July 10, 1919 July 10, 1919 Sept. 2, 1920	7,619 840 120	164,431	156,000
			148			8,579		
Nebraska.....							761	761
Nevada.....							27,543	27,543
New Mexico.....	740	May 24, 1920	2,970				62,602	65,572
Oregon.....	725 729 728 730 742	Dec. 6, 1919 Dec. 27, 1919 do Feb. 19, 1920 June 2, 1920	272 240 7,728 7,086 1,288	283 287 288	July 10, 1919 Aug. 29, 1919 Sept. 29, 1919	40 7,072 80		
			16,714			7,192	422,744	432,266
Utah.....	732	Dec. 22, 1919	6,880	289	do	475	448,696	455,101
Washington.....	725 742	Dec. 6, 1919 June 2, 1920	120 768					
			888				113,248	114,136
Wyoming.....	735 739	May 13, 1920 May 18, 1920	55 10					
			65				88,311	88,376
Total.....			62,094			41,046	2,565,535	2,586,583

Report of withdrawals made under the act of June 25, 1910 (36 Stat., 847), as amended by the act of Aug. 24, 1912 (37 Stat., 497), and the restorations therefrom, from July 1, 1919, to June 30, 1920—Continued.

WITHDRAWALS FOR AND RESTORATIONS FROM PUBLIC WATER RESERVES.

States.	Public water withdrawals.			Public water restorations.				
	Number.	Date of approval.	Area.	Number.	Date of approval.	Area.	Outstanding	
							July 1, 1919.	June 30, 1920.
Arizona.....	8	July 19, 1919	Acres. 275			Acres.		
	72	May 25, 1920	60					
			335				13,826	14,161
California.....	66	July 10, 1919	1,680					
	69	June 26, 1920	1,972	18	July 10, 1919	85		
	70	Mar. 8, 1920	160					
			3,812				56,034	59,761
Colorado.....	66	Aug. 15, 1919	1,120				1,900	1,900
Idaho.....	68	Dec. 27, 1919	2,480					
			3,600				7,040	10,640
Montana.....	68	do	320					
	70	Mar. 8, 1920	80					
	71	May 6, 1920	40					
			440				7,284	7,724
Nevada.....	66	Aug. 15, 1919	480					
	70	Mar. 8, 1920	1,500					
	73	June 8, 1920	40					
			2,020				4,833	6,853
New Mexico.....	65	July 10, 1919	2,520					
	70	Mar. 8, 1920	160					
			2,680				3,361	6,041
Oregon.....	70	do	640				11,744	12,384
South Dakota.....							240	240
Utah.....	66	Aug. 15, 1919	720				34,867	35,587
Washington.....	67	Sept. 29, 1919	120				760	880
Wyoming.....							84,192	84,192
Total.....			14,367			85	226,081	240,363

WELL-DRILLING RESERVES.

[Act June 12, 1917 (40 Stat., 105).]

Montana.....							40	40
Nevada.....							80	80
Total.....							120	120

RESERVOIR SITES.

Montana.....							9,080	9,080
North Dakota.....							478	478
Oregon.....							10,619	10,619
Washington.....							35,943	35,943
Wyoming.....	12	Mar. 31, 1920	1,714				5,020	6,734
Total.....			1,714				61,140	62,854

Report of withdrawals made under the act of June 25, 1910 (36 Stats., 847), as amended by the act of Aug. 24, 1912 (37 Stat., 497), and the restorations therefrom, from July 1, 1919, to June 30, 1920—Continued.

INDIAN POWER-SITE WITHDRAWALS.

[Between Aug. 17, 1910, and July 19, 1915, 6 Indian power-site withdrawals were made, by Executive order, but because no area was given in any of such withdrawals they have not been reported in previous reports.]

States.	Public water withdrawals.			Public water restorations.				
	Num-ber.	Date of appro-val.	Area.	Num-ber.	Date of appro-val.	Area.	Outstanding	
							July 1, 1919	June 30, 1920.
Wyoming.....			Acres.			Acres.	19,000	19,000

MISCELLANEOUS RESERVATIONS.

Alaska.....							230,000	230,000
California.....							30,880	30,880
Colorado.....							1,727	1,727
Oregon.....							1,850,000	1,850,000
Washington.....							560	560
Total.....							2,113,167	2,113,167

POWER-SITE DESIGNATIONS MADE UNDER ARIZONA AND NEW MEXICO ENABLING ACT OF JUNE 20, 1910 (36 STAT., 557, 564, 575), AND OREGON-CALIFORNIA LAND-GRANT AMENDMENT ACT OF JUNE 9, 1916 (39 STAT., 216).

Arizona.....							758,083	758,083
New Mexico.....							201,500	201,500
Oregon.....	16	Oct. 24, 1919	380				141,273	141,653
Total.....			380				1,100,856	1,101,236

Withdrawals and restorations, under the act of June 17, 1902 (32 stat., 388), and the acts amendatory of and supplemental thereto, for the fiscal year ending June 30, 1920.

States.	Project.	Withdrawals.	Restorations.
		<i>Acres.</i>	<i>Acres.</i>
Arizona.....	Yuma.....	13,340	400
	Salt River.....	30,725	360
	Sentinel.....		600
	Colorado River storage.....	34,560	1,215,680
	Miscellaneous reservoir sites.....	10,900	
		89,525	1,217,040
California.....	Yuma.....	18,565	444,240
	Newlands.....		3,760
	Colorado River.....		
	Owens Valley.....	177,280	2,560
	Pit River.....	320	
	Madera.....	115,200	
	Miscellaneous reservoir sites.....	19,200	
		330,565	450,560
Colorado.....	Uncompahgre Valley.....	10	440
	Grand Valley.....		15,280
		10	15,720
Idaho.....	Boise.....	205	800
	Minidoka.....	30,280	1,000
	King Hill.....	4,680	
	Mountain Home.....		3,240
		35,165	5,040
Montana.....	Milk River.....	3,440	48,880
	Sun River.....	160	1,520
	Fort Peck.....		80
	Miscellaneous reservoir sites.....		160
	Flathead.....		2,160
	Huntley.....	80	
	Blackfoot.....	40	
		3,720	52,800
Nebraska.....	North Platte.....	160	80
Nevada.....	Colorado River storage.....	81,920	205,440
	Newlands.....	11,690	41,445
		93,610	246,885
New Mexico.....	San Carlos.....	57,000	320
Oregon.....	Umatilla.....		800
	Klamath.....	370	760
	Deschutes.....		480
	Miscellaneous reservoir sites.....	80	
		450	2,040
South Dakota.....	Bellefourche.....	10	200
Utah.....	Castle Peak.....		180
	Colorado River storage.....		260
	Dixie.....	(1)	160
	Miscellaneous reservoir sites.....		1,140
	Price River.....		360
			2,080
Washington.....	Yakima.....	3,200	135,440
Wyoming.....	Green River.....	259,840	
	North Platte.....	170	250
	Shoshone.....		12,580
	Riverton.....	1,280	37,280
		261,290	50,110
Total acreage.....		874,705	2,178,315

¹ None.

Power projects—Payments made pursuant in permits and easements granted under the acts of Feb. 15, 1901 (31 Stat., 790), and Mar. 4, 1911 (36 Stat., 1255), respectively, during fiscal year ending June 30, 1920.

State or territory and permittee or grantee.	Character of grant or permit.	Project.	Payment.
Alaska:			
Alaska Gastineau Mining Co.....	Final.....	Power.....	\$2,900.00
Saw Tooth Power Project.....	Preliminary.....	.....do.....	100.00
Arizona:			
New Cornelia Copper Co.....	Final.....	Transmission.....	30.00
Gila Copper Sulphide Co.....	.....do.....	.....do.....	15.00
Calumet & Arizona Mining Co.....	.....do.....	.....do.....	20.00
Phelps-Dodge Corporation.....	.....do.....	.....do.....	40.00
California:			
Southern Sierras Power Co.....	.....do.....	.....do.....	165.00
City of Los Angeles.....	.....do.....	.....do.....	50.00
Southern California Edison Co.....	.....do.....	.....do.....	345.00
San Diego Consolidated Gas & Electric Co.....	.....do.....	.....do.....	5.00
Truckee River General Electric Co.....	.....do.....	.....do.....	38.42
Mount Konocli Light & Power Co.....	.....do.....	.....do.....	1.50
Idaho:			
Nevada Power Co.....	.....do.....	.....do.....	165.00
Ashton & St. Anthony Power Co.....	.....do.....	.....do.....	112.50
Montana:			
Montana Power Co.....	.....do.....	.....do.....	1,016.00
Great Falls Power Co.....	.....do.....	.....do.....	775.00
Chicago, Milwaukee & St. Paul Ry. Co.....	.....do.....	.....do.....	75.00
Mission Range Power Co.....	.....do.....	Power.....	66.00
Flathead Valley Electric Co.....	.....do.....	.....do.....	10.00
Nevada:			
Nevada Valleys Power Co.....	.....do.....	Transmission.....	270.00
Utah:			
Vernal Mining & Light Co.....	.....do.....	.....do.....	150.50
Ophir Hill Consolidated Mining Co.....	.....do.....	Power.....	961.50
Washington:			
Intermountain Power Co.....	.....do.....	.....do.....	15.00
Wyoming:			
Fremont Power Co.....	.....do.....	Transmission.....	2.38
Union Pacific Coal Co.....	.....do.....	.....do.....	50.00
Liberty Potash Co.....	.....do.....	.....do.....	5.00
Total.....			7,383.80

Public and Indian lands entered each year ended June 30, from 1914 to 1920, inclusive.

State or Territory.	1914	1915	1916	1917	1918	1919	1920
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Alabama.....	39,485.65	25,154.63	21,229.16	14,255.54	9,310.44	14,438.87	20,993.76
Alaska.....	3,144.15	22,036.02	33,940.98	32,741.40	12,977.93	6,795.73	12,697.18
Arizona.....	765,962.11	291,557.70	1,881,044.63	1,431,627.45	1,236,786.93	512,885.03	1,831,724.30
Arkansas.....	174,665.29	165,080.01	184,359.50	160,645.85	97,476.05	78,787.28	91,399.52
California.....	878,874.21	1,001,663.53	640,361.85	754,964.55	288,041.59	520,592.84	913,620.80
Colorado.....	1,433,305.88	2,666,068.22	3,076,601.22	2,092,705.73	1,301,908.88	1,724,364.07	1,912,867.17
Florida.....	70,302.88	66,988.42	58,455.29	43,624.78	36,319.10	21,025.83	28,671.83
Idaho.....	947,553.93	1,144,276.80	1,066,352.41	769,455.55	556,668.62	653,513.06	925,205.12
Kansas.....	41,651.71	68,190.59	212,288.36	114,772.39	46,457.75	47,739.47	15,459.36
Louisiana.....	19,781.87	15,618.56	18,358.07	16,545.15	13,714.36	7,447.88	10,940.03
Michigan.....	16,900.73	14,981.80	10,751.32	9,570.89	6,913.21	7,222.50	6,562.27
Minnesota.....	323,305.20	298,534.64	268,140.25	109,455.90	59,877.25	158,891.40	187,618.64
Mississippi.....	19,918.35	18,007.56	18,381.11	15,205.05	10,443.24	7,806.98	11,365.11
Missouri.....	2,813.91	2,572.69	1,744.36	1,324.89	320.00	400.00	1,000.00
Montana.....	5,386,954.28	4,187,364.36	4,038,658.80	4,206,095.60	2,659,880.77	1,659,085.88	2,221,684.25
Nebraska.....	1,037,242.10	372,323.52	219,504.29	109,825.04	66,203.38	47,614.90	51,141.44
Nevada.....	194,308.33	290,138.53	212,554.83	92,871.29	124,540.78	292,873.58	182,292.00
New Mexico.....	1,070,138.66	3,266,995.81	2,831,204.86	1,850,779.81	1,033,681.76	2,206,491.33	1,460,164.37
North Dakota.....	604,264.16	365,719.63	337,089.13	321,494.13	148,158.36	78,466.68	102,612.84
Oklahoma.....	51,568.38	50,963.96	54,043.83	57,934.20	33,275.23	30,448.30	16,518.02
Oregon.....	839,990.89	738,401.77	561,739.40	428,255.14	252,666.17	421,335.07	1,024,518.96
South Dakota.....	378,469.32	321,763.13	1,045,854.96	1,213,326.90	338,745.18	714,700.29	845,905.86
Utah.....	189,781.34	373,507.39	335,101.87	461,178.17	244,224.35	212,688.24	405,527.23
Washington.....	294,930.73	324,384.09	188,488.08	433,168.16	185,778.80	191,296.47	230,296.63
Wisconsin.....	10,430.11	8,116.32	5,615.18	4,068.53	3,613.57	2,577.32	5,199.97
Wyoming.....	927,007.95	760,815.11	1,721,289.23	1,455,954.22	1,166,347.91	2,252,690.48	3,921,504.89
Total.....	16,522,852.12	16,861,214.69	19,043,152.92	16,201,794.38	9,974,331.61	11,871,181.50	16,437,491.55

Public lands surveyed and remaining unsurveyed in public land States, including Alaska.

	Land area.	Surveyed during fiscal year ending June 30, 1920.	Surveyed to June 30, 1920.	Unsurveyed to June 30, 1920.	Resurveyed during fiscal year ending June 30, 1920.
	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>
Alabama.....	32,818,560		32,818,560		
Alaska.....	378,165,760	107,049	1,251,488	378,914,262	
Arizona.....	72,538,400	4,256,151	35,284,306	37,554,094	251,903
Arkansas.....	33,616,000	3,619	33,616,000		
California.....	99,617,280	173,863	80,933,100	18,684,180	425,864
Colorado.....	66,341,120	52,642	63,609,272	2,671,848	766,789
Florida.....	35,111,040		35,111,040		8,960
Idaho.....	53,246,560	544,703	36,122,437	17,224,123	
Illinois.....	35,867,520		35,867,520		
Indiana.....	23,068,800		23,068,800		
Iowa.....	35,575,040		35,575,040		
Kansas.....	52,335,360		52,335,360		
Louisiana.....	29,061,760		29,061,760		
Michigan.....	36,787,200	7,533	36,787,200		
Minnesota.....	51,749,120	4,668	51,749,120		
Mississippi.....	29,671,680		29,671,680		
Missouri.....	43,985,280		43,985,280		
Montana.....	93,568,640	1,665,447	77,796,979	15,771,661	
Nebraska.....	49,157,120		49,157,120		485,151
Nevada.....	70,285,440	458,534	44,761,235	16,335,139	
New Mexico.....	78,401,920	1,672,500	62,066,781	25,524,205	98,154
North Dakota.....	44,917,120		44,917,120		
Ohio.....	26,073,600		26,073,600		
Oklahoma.....	44,424,960		44,424,960		
Oregon.....	61,185,480	125,085	53,341,279	7,847,201	
South Dakota.....	49,195,520	58,455	48,898,596	306,924	
Utah.....	52,597,760	555,597	33,580,151	19,017,609	
Washington.....	42,775,040	253,750	34,986,934	7,788,106	7,048
Wisconsin.....	35,363,840		35,363,840		
Wyoming.....	62,460,160	28,749	58,817,911	3,642,249	470,437
Total.....	1,820,866,060	9,964,409	1,271,084,479	549,281,601	2,514,306

Aggregate area surveys and resurveys accepted in fiscal year 1920, 12,478,715 acres.

NOTE.—In Arkansas, Florida, Michigan, Minnesota, and Mississippi the lands surveyed last year were not regarded as public land when the surrounding lands were originally surveyed, and are counted in the aggregate of each State.

Estimated area of existing national forests, June 30, 1920.

[A little over 86 per cent is public.]

	<i>Acres.</i>		<i>Acres.</i>
Alabama.....	198,385	New Mexico.....	9,487,046
Alaska.....	20,713,204	North Carolina.....	1,283,101
Arizona.....	12,282,558	Oklahoma.....	61,640
Arkansas.....	1,469,906	Oregon.....	15,415,223
California.....	24,003,190	Porto Rico.....	65,950
Colorado.....	14,748,943	South Carolina.....	137,216
Florida.....	675,420	South Dakota.....	1,303,153
Georgia.....	680,550	Tennessee.....	368,592
Idaho.....	20,089,292	Utah.....	7,945,025
Maine.....	115,558	Virginia.....	1,079,116
Michigan.....	163,878	Washington.....	11,624,374
Minnesota.....	1,581,014	West Virginia.....	845,516
Montana.....	18,929,749	Wyoming.....	8,694,785
Nebraska.....	217,808		
Nevada.....	5,251,030	Total area.....	180,299,776
New Hampshire.....	870,554		

	<i>Acres.</i>
Area added to national forests during year.....	2,035,761
Area excluded from national forests during year.....	69,432
Increase due to inclusion in gross total of entire area within exterior limits of national forests established under the act of Mar. 1, 1911 (36 Stat., 961).....	4,072,054
Area within temporary forest withdrawals, June 30, 1920.....	563,927
Area of existing national forests, June 30, 1919.....	174,261,393
Area of existing national forests, June 30, 1920.....	180,299,776

National forests, by States, together with estimated areas thereof, June 30, 1920.

State or Territory.	Forest.	Area.	State or Territory.	Forest.	Area.
		<i>Acres.</i>			<i>Acres.</i>
Alabama.....	Alabama.....	198,385	Idaho.....	Clearwater.....	907,846
Alaska.....	Chugach.....	5,232,204		Coeur d'Alene.....	490,234
	Tongass.....	15,481,000		Idaho.....	1,911,996
Total.....		20,713,204		Kaniksu ¹	297,653
Arizona.....	Apache.....	1,276,400		Lemhi.....	1,100,562
	Coconino.....	1,915,571		Minidoka ¹	531,120
	Coronado ¹	1,357,828		Nezperce ¹	1,666,079
	Crook.....	913,723		Payette.....	1,234,239
	Dixie ¹	17,680		Pend Oreille.....	874,738
	Kaibab.....	752,900		St. Joe.....	871,988
	Prescott.....	1,644,845		Salmon.....	1,643,360
	Sitgreaves.....	893,720		Sawtooth.....	1,177,821
	Tonto.....	2,033,760		Selway.....	1,802,000
	Tusayan.....	1,476,129		Targhee ¹	1,025,740
Total.....		12,282,558	Total.....		20,089,292
Arkansas.....	Arkansas.....	958,290	Maine.....	White Mountains ¹	115,558
	Ozark.....	511,616	Michigan.....	Michigan.....	163,878
Total.....		1,469,906	Minnesota.....	Minnesota.....	312,476
California.....	Anceles.....	1,038,532		Superior.....	1,268,538
	California.....	1,062,622	Total.....		1,581,014
	Cleveland.....	813,616	Montana.....	Absaroka.....	987,710
	Crater ¹	57,022		Beartooth.....	691,930
	Eldorado ¹	835,800		Beaverhead.....	1,365,000
	Inyo ¹	1,249,252		Bitterroot.....	1,155,868
	Klamath ¹	1,734,665		Blackfoot.....	1,128,615
	Lassen.....	1,321,343		Cabinet.....	1,043,224
	Modoc.....	1,582,859		Custer ¹	597,488
	Mono ¹	874,561		Deerlodge.....	964,000
	Plumas.....	1,432,860		Flathead.....	2,003,339
	Santa Barbara.....	2,288,788		Gallatin.....	909,430
	Sequoia.....	2,021,609		Helena.....	888,631
	Shasta.....	1,586,880		Jefferson.....	1,175,685
	Sierra.....	1,662,560		Kootenai.....	1,617,140
	Siskiyou ¹	401,795		Lewis and Clark.....	826,360
	Stanislaus.....	1,104,412		Lolo.....	1,181,018
	Tahoe ¹	1,167,537		Madison.....	1,035,520
	Trinity.....	1,746,147		Missoula.....	1,368,191
Total.....		24,003,190	Total.....		18,929,749
Colorado.....	Arapaho.....	680,021	Nebraska.....	Nebraska.....	217,808
	Battlement.....	672,238	Nevada.....	Dixie ¹	63,410
	Cochetopa.....	930,220		Eldorado ¹	400,000
	Colorado.....	1,149,594		Humboldt.....	1,468,218
	Durango.....	704,000		Inyo ¹	58,777
	Gunnison.....	951,310		Mono ¹	483,519
	Hayden ¹	72,000		Nevada.....	1,197,061
	Holy Cross.....	605,700		Tahoe ¹	54,845
	La Sal ¹	27,620		Toiyabe.....	1,924,800
	Leadville.....	1,056,520	Total.....		5,251,030
	Montezuma.....	812,100	Hampshire.....	White Mountain ¹	870,554
	Pike.....	1,256,112	New Mexico.....	Carson.....	925,301
	Rio Grande.....	1,221,140		Coronado ¹	129,172
	Routt.....	819,278		Jatil.....	2,941,202
	San Isabel.....	651,200		Gila.....	1,600,000
	San Juan.....	745,000		Lincoln.....	1,472,079
	Sopris.....	656,000		Manzano.....	927,919
	Uncompaghe.....	867,860		Santa Fe.....	1,491,393
	White River.....	871,030	Total.....		9,487,046
Total.....		14,748,943	North Carolina.....	Roone.....	492,340
Florida.....	Florida.....	675,420		Cherokee ¹	44,851
Georgia.....	Cherokee ¹	416,256		Nantahala ¹	419,624
	Nantahala ¹	264,294		Pisgah.....	335,886
Total.....		680,550	Total.....		1,283,101
Idaho.....	Boise.....	1,118,114	Oklahoma.....	Wichita.....	61,640
	Cache ¹	507,621			
	Caribou ¹	699,267			
	Challis.....	1,269,292			

¹ Forest in more than one State.

National forests, by States, together with estimated areas thereof, June 30, 1920—Contd.

State or Territory.	Forest.	Area.	State or Territory.	Forest.	Area.
		<i>Acres.</i>			<i>Acres.</i>
Oregon.....	Cascade.....	1,094,485	Virginia.....	Monongahela ¹	23,245
	Crater ¹	1,079,325		Natural Bridge.....	279,986
	Deschutes.....	1,463,840		Shenandoah ¹	775,885
	Fremont.....	935,714		Total.....	1,079,116
	Klamath ¹	8,893	Washington.....	Chelan.....	724,110
	Malheur.....	1,262,840		Columbia.....	942,200
	Ochoco.....	821,891		Colville.....	816,000
	Oregon.....	1,156,502		Kanl'ksu ¹	376,763
	Santiam.....	719,983		Okanogan.....	1,541,000
	Siskiyou ¹	1,255,250		Olympic.....	1,662,000
	Stuslaw.....	833,441		Rainier.....	1,561,470
	Umatilla.....	564,985		Snoqualmie.....	1,042,000
	Umpqua.....	1,221,391		Washington.....	1,490,000
	Wallowa.....	1,053,537		Wenaha ¹	321,831
	Wenaha ¹	461,964		Wenatchie.....	1,157,000
	Whitman.....	1,482,192		Total.....	11,624,374
	Total.....	15,415,223	West Virginia.....	Monongahela ¹	653,721
Porto Rico.....	Luquillo.....	65,950		Shenandoah ¹	191,795
South Carolina.....	Nantahala ¹	137,216		Total.....	845,516
	Black Hills ¹	602,011	Wyoming.....	Ashley ¹	6,060
	Harney.....	621,388		Bighorn.....	1,136,200
South Dakota.....	Chester ¹	79,754		Black Hills.....	179,121
	Total.....	1,303,153		Bridger.....	717,977
Tennessee.....	Cherokee ¹	366,592		Caribou ¹	7,240
	Total.....	1,303,153		Hayden ¹	365,620
Utah.....	Ashley ¹	981,613		Medicine Bow.....	511,382
	Cache ¹	317,506		Shoshone.....	1,609,000
	Dixie ¹	466,141		Targhee ¹	339,070
	Fillmore.....	779,290		Teton.....	1,971,192
	Fishlake.....	723,591		Washakie.....	864,873
	La Sal ¹	524,715		Wyoming.....	987,050
	Manti.....	855,722		Total.....	8,694,785
	Minidoka ¹	92,280		Total of 1:2 national forests.....	180,299,776
	Powell.....	704,700			
	Sevier.....	799,855			
	Uinta.....	1,043,135			
	Wasatch.....	656,477			
	Total.....	7,945,025			

¹ Forest in more than one State.

List of bird reserves.

Name of reservation.	Date.	Location.	Area.
Pelican Island.....	Mar. 14, 1903	East Florida coast.....	5.50 acres.
Breton Island.....	{ Oct. 4, 1904 Nov. 11, 1905	Southeast coast of Louisiana.....	Unknown.
Stump Lake.....	Mar. 9, 1905	North Dakota.....	27.39 acres.
Huron Islands.....	Oct. 10, 1905	Lake Superior, Mich.....	Unknown.
Siskiwit Islands.....	do.	do.	Do.
Passage Key.....	do.	Tampa Bay, Fla.....	36.37 acres.
Indian Key.....	Feb. 10, 1906	do.	90 acres.
Tern Islands.....	Aug. 8, 1907	Mouths of Mississippi River, La.....	Unknown.
Shell Keys.....	Aug. 17, 1907	South Louisiana coast.....	Do.
Three Arch Rocks.....	Oct. 14, 1907	West Oregon coast.....	Do.
Flattery Rocks.....	Oct. 23, 1907	West Washington coast.....	Do.
Quillayute Needles.....	do.	do.	Do.
Copalis Rock.....	do.	do.	Do.
East Timbalier Island.....	Dec. 7, 1907	South Louisiana coast.....	Do.
Mosquito Inlet.....	Feb. 24, 1908	East Florida coast.....	Do.
Tortugas Keys.....	Apr. 6, 1908	Florida Keys, Fla.....	Do.
Klamath Lake.....	Aug. 8, 1908	Oregon and California.....	Do.
Key West.....	do.	Florida Keys, Fla.....	Do.
Lake Malheur.....	Aug. 18, 1908	Oregon.....	Do.
Chase Lake.....	Aug. 28, 1908	North Dakota.....	Do.

List of bird reserves—Continued.

Name of reservation.	Date.	Location.	Area.
Pine Island.....	Sept. 15, 1908	West Florida coast.....	Unknown.
Matlacha Pass.....	Sept. 26, 1908	do.....	Do.
Palma Sola.....	do.....	do.....	Do.
Island Bay.....	Oct. 23, 1908	Florida.....	Do.
Loch Katrine.....	Oct. 26, 1908	Wyoming.....	Do.
Hawaiian Islands.....	Feb. 3, 1909	Hawaii.....	Do.
East Park.....	Feb. 25, 1909	California.....	Do.
Cold Springs.....	do.....	Oregon.....	Do.
Shoshone.....	do.....	Wyoming.....	Do.
Pathfinder.....	do.....	do.....	Do.
Bellefourche.....	do.....	South Dakota.....	Do.
Strawberry Valley.....	do.....	Utah.....	Do.
Salt River.....	do.....	Arizona.....	Do.
Deer Flat.....	do.....	Idaho.....	Do.
Minidoka.....	do.....	do.....	Do.
Willow Creek.....	do.....	Montana.....	Do.
Carlsbad.....	do.....	New Mexico.....	Do.
Rio Grande.....	do.....	do.....	Do.
Keechelus Lake.....	do.....	Washington.....	Do.
Kachess Lake.....	do.....	do.....	Do.
Clealum Lake.....	do.....	do.....	Do.
Bumping Lake.....	do.....	do.....	Do.
Conconully.....	do.....	do.....	Do.
Bering Sea.....	Feb. 27, 1909	Alaska.....	Do.
Pribilof ¹	do.....	do.....	Do.
Tuxedni.....	do.....	do.....	Do.
Farallon.....	do.....	California.....	Do.
Culebra.....	do.....	Porto Rico.....	Do.
Yukon Delta.....	do.....	Alaska.....	Do.
St. Lazaria.....	do.....	do.....	Do.
Boguslof.....	Mar. 2, 1909	do.....	Do.
Clear Lake.....	Apr. 11, 1911	California.....	Do.
Forrester Island.....	Jan. 11, 1912	Alaska.....	Do.
Hazy Islands.....	do.....	do.....	Do.
Niobrara.....	do.....	Nebraska.....	14.64 acres +
Green Bay.....	Feb. 21, 1912	Wisconsin.....	1.87 acres.
Chamisso Island.....	Dec. 7, 1912	Alaska.....	Unknown.
Pishkun.....	Dec. 17, 1912	Montana.....	Do.
Desecheo Island.....	Dec. 19, 1912	Porto Rico.....	Do.
Gravel Island.....	Jan. 9, 1913	Wisconsin.....	Do.
Aleutian Islands.....	Mar. 3, 1913	Alaska.....	Do.
Canal Zone ²	Mar. 19, 1913	Panama.....	Do.
Walker Lake.....	Apr. 21, 1913	Arkansas.....	Do.
Petit Bois Islands.....	May 6, 1913	Alabama and Mississippi.....	Do.
Anaho Island.....	Sept. 4, 1913	Nevada.....	247.73 acres.
Smith Island.....	June 6, 1914	Washington.....	Unknown.
Dungeness Spit.....	Jan. 20, 1915	do.....	226.02 acres.
Ediz Hook.....	do.....	do.....	83 acres. ³
Mille Lacs.....	May 14, 1915	Minnesota.....	Unknown.
Big Lake.....	Aug. 6, 1915	Arkansas.....	Do.
San Francisco Bay.....	Aug. 9, 1916	California.....	141 acres.
North Platte.....	Aug. 21, 1916	Nebraska.....	Unknown.
BIRD RESERVES ENLARGED OR REDUCED.			
Pelican Island.....	Jan. 26, 1909	Florida (enlarged).....	Unknown.
Mosquito Inlet.....	Apr. 2, 1909	do.....	Do.
Cold Springs.....	Nov. 25, 1911	Oregon (enlarged).....	Do.
Clear Lake.....	Jan. 13, 1912	California (reduced).....	Do.
Minidoka.....	Feb. 21, 1912	Idaho (enlarged).....	Do.
Niobrara.....	Nov. 14, 1912	Nebraska (enlarged).....	15,906.5 acres.
Deer Flat.....	Apr. 21, 1915	Idaho (reduced).....	Unknown.
Klamath Lake.....	May 14, 1915	Oregon and California (reduced).....	Do.

¹ Transferred to Bureau of Fisheries.² Approximate area.³ Under jurisdiction of Isthmian Canal Commission. Canal Zone, strictly speaking, not a bird reservation, but birds are protected by Executive order.

Total reservations, excluding Canal Zone, 71.

Aggregate cash receipts from the disposal of public and Indian lands from May 20, 1785, to June 30, 1920.

Fiscal years.	Cash sales.	Amount of fees and commissions.	Total receipts from fees and disposal of public lands.	Receipts from sales of Indian lands.	Miscellaneous receipts	Aggregate receipts from all sources.
May 20, 1785, to June 30, 1880.						\$208,059,657.14
1881	\$3,534,550.98	\$980,833.65	\$4,395,384.63	\$1,006,691.63	\$6,727.90	5,408,804.16
1882	6,628,775.92	1,124,531.15	7,753,307.07	634,617.22	6,591.75	8,394,516.04
1883	9,657,032.28	1,422,329.10	11,080,361.38	625,404.27	8,118.05	11,713,883.70
1884	10,304,582.49	1,536,410.58	11,840,993.07	938,137.26	10,274.76	12,789,405.09
1885	6,223,928.74	1,462,188.06	7,686,114.80	933,483.52	8,821.88	8,628,420.18
1886	5,757,891.06	1,654,878.25	7,412,767.31	1,607,729.63	10,587.40	9,031,084.34
1887	9,248,321.33	1,637,600.39	10,783,921.72	1,484,302.30	20,784.85	12,289,008.87
1888	11,203,071.95	1,498,000.05	12,701,072.00	821,113.77	24,951.65	13,547,137.42
1889	8,018,254.50	1,251,971.23	9,270,225.73	389,524.72	26,150.89	9,685,901.34
1890	6,349,174.24	1,121,696.07	7,470,870.31	293,062.30	16,585.00	7,780,517.61
1891	4,160,009.07	944,938.65	5,105,037.72	318,333.42	5,849.00	5,429,220.14
1892	3,322,865.01	1,084,805.26	4,387,670.27	456,681.84	15,787.58	4,860,109.69
1893	3,193,280.64	998,184.63	4,191,465.29	284,752.65	3,516.20	4,479,734.14
1894	1,653,080.71	1,021,205.08	2,674,285.79	91,981.03	1,557.50	2,767,824.32
1895	1,116,090.07	750,710.59	1,866,800.66	149,879.48	16,773.89	2,033,454.03
1896	1,053,905.59	793,557.82	1,847,463.41	214,700.42	44,197.84	2,106,361.67
1897	917,911.19	678,469.55	1,596,380.74	438,716.31	52,824.23	2,087,931.28
1898	1,291,076.10	853,265.50	2,144,341.60	100,317.49	33,336.09	2,277,995.18
1899	1,703,988.32	890,702.17	2,594,690.49	442,913.73	32,533.12	3,070,137.24
1900	2,899,371.83	1,157,081.03	4,056,452.86	239,769.39	53,175.85	4,379,758.10
1901	2,966,442.86	1,340,894.29	4,307,337.15	585,661.27	79,062.37	4,972,160.79
1902	4,139,268.47	1,740,320.18	5,880,088.65	288,668.68	93,171.85	6,261,927.18
1903	8,960,471.18	1,597,147.48	10,557,618.66	308,939.14	158,185.85	11,024,743.65
1904	7,445,902.84	1,349,990.89	8,795,893.73	333,757.62	153,690.63	9,283,341.98
1905	4,849,766.06	1,286,621.93	6,136,387.98	791,807.67	89,615.72	7,017,811.38
1906	4,835,988.82	1,642,488.56	6,528,477.38	967,532.50	89,514.02	7,585,523.90
1907	7,728,114.30	1,819,159.21	9,547,273.51	1,892,805.70	113,068.79	11,553,178.00
1908	9,760,570.19	1,731,883.57	11,492,453.76	997,972.52	225,283.18	12,715,709.46
1909	7,698,337.03	1,536,890.67	9,235,227.70	2,334,885.47	330,136.61	12,216,415.39
1910	6,342,744.75	2,028,892.35	8,371,637.10	2,037,551.68	1,054,735.28	11,463,924.06
1911	5,783,693.39	1,461,514.30	7,195,187.69	2,822,600.71	1,022,119.20	11,089,927.60
1912	5,437,502.07	1,234,216.47	6,671,718.54	2,294,538.37	1,016,791.09	9,973,048.00
1913	2,746,546.52	1,540,994.15	4,287,540.67	2,118,469.34	1,548,494.80	6,955,504.81
1914	2,650,761.84	1,654,085.02	4,304,846.86	1,944,802.77	47,677.90	6,143,367.63
1915	2,331,368.44	1,581,805.48	3,913,173.92	1,556,630.97	28,886.01	5,394,948.20
1916	1,769,860.33	1,660,933.33	3,430,793.66	1,972,299.49	41,468.44	5,444,561.59
1917	1,935,954.53	1,641,860.14	3,577,814.67	2,445,582.52	126,233.35	6,149,630.54
1918	2,050,575.58	1,160,350.88	3,210,926.46	1,936,773.78	285,127.47	5,431,827.66
1919	1,464,718.99	1,194,472.10	2,659,191.09	1,387,781.74	250,701.33	4,303,674.16
1920	1,990,764.16	1,587,060.79	3,577,824.95	2,063,186.06	490,765.40	6,131,776.41
Total.....						501,865,552.74

¹ Includes reclamation water-right charges.

² Includes \$152.88 originally erroneously reported as Indian sale.

³ Does not include \$152.88 mentioned in footnote 2.

Reclamation water-right charges under act of Aug. 9, 1912 (37 Stat., 265) were collected from Jan. 1, 1913, by the Reclamation Service.

Amounts accrued and paid to States for purposes of education, or of making public roads and improvements on account of grants 2, 3, and 5 per cent of net proceeds of sales of public lands lying within said States.

State.	Total to June 30, 1918.	Fiscal year 1919.	Aggregate to June 30, 1919, inclusive.
Alabama.....	\$1,079,726.77	\$125.80	\$1,079,852.57
Arizona.....	21,843.33	2,300.73	24,144.06
Arkansas.....	327,992.71	782.72	328,775.43
California.....	1,139,243.57	4,138.13	1,143,381.70
Colorado.....	500,849.10	4,011.33	504,860.43
Florida.....	143,555.20	142.40	143,697.60
Idaho.....	281,439.11	3,995.80	285,434.91
Illinois.....	1,187,908.89		1,187,908.89
Indiana.....	1,040,255.26		1,040,255.26
Iowa.....	633,638.10		633,638.10
Kansas.....	1,127,932.89	10.33	1,127,943.22
Louisiana.....	468,831.88		468,831.88
Michigan.....	588,193.03	301.54	588,494.57
Minnesota.....	592,890.03	441.15	593,331.18
Mississippi.....	1,070,843.96	125.13	1,070,969.09
Missouri.....	1,061,066.89	34.75	1,061,101.64
Montana.....	539,086.47	12,926.80	551,993.27
Nebraska.....	571,224.21	1,294.57	572,518.78
Nevada.....	41,561.34	637.48	42,198.82
New Mexico.....	139,297.56	1,791.54	141,089.10
North Dakota.....	538,121.81	241.04	538,362.85
Ohio.....	999,353.01		999,353.01
Oklahoma.....	64,931.95	316.42	65,248.37
Oregon.....	748,871.66	2,528.78	751,400.44
South Dakota.....	342,484.05	1,384.25	343,868.30
Utah.....	121,359.21	5,116.51	126,475.72
Washington.....	426,177.91	1,416.16	427,594.07
Wisconsin.....	586,645.26		586,645.26
Wyoming.....	268,782.84	13,116.26	281,899.10
Total.....	16,654,068.00	57,159.62	16,711,227.62

Amounts covered into the Treasury to the credit of the reclamation fund from the sales of public lands and fees and commissions in the several States, under the act of June 17, 1902 (32 Stat., 388).

State.	Fiscal years—		Total for 19 years ended June 30, 1919.
	1901 to 1918	1919	
Arizona.....	\$1,581,601.50	\$75,563.83	\$1,657,165.33
California.....	6,461,628.18	127,122.32	6,588,750.50
Colorado.....	8,397,826.35	275,660.95	8,673,487.30
Idaho.....	6,028,695.60	141,187.58	6,169,883.18
Kansas.....	1,020,751.24	3,064.34	1,023,815.68
Montana.....	12,939,721.08	448,085.40	13,387,796.48
Nebraska.....	1,974,531.69	37,821.77	2,012,353.46
Nevada.....	718,606.87	20,261.16	738,868.03
New Mexico.....	4,775,181.26	185,814.44	4,960,995.70
North Dakota.....	12,144,297.38	10,655.63	12,154,953.01
Oklahoma.....	5,881,534.93	7,942.37	5,889,477.30
Oregon.....	11,059,462.95	86,396.08	11,145,859.03
South Dakota.....	7,424,288.06	59,116.23	7,483,404.29
Utah.....	2,537,594.83	122,331.57	2,660,926.40
Washington.....	7,053,892.51	42,694.74	7,096,587.25
Wyoming.....	5,622,802.87	396,433.07	6,018,235.94
Total.....	95,622,417.40	2,040,031.48	97,662,448.88

Alleged fraudulent entries acted upon during 1919-20.

	Pending 1919.	Re- ceived.	Ap- proved.	Canceled.	Other- wise dis- posed of.	Total.	Pending 1920.	Hearings ordered.
Homesteads:								
Originals.....	9,021	12,161	.....	396	9,994	10,390	10,792	246
Finals.....	192	4,336	3,498	6	700	4,204	324	20
Cash.....	13	220	104	2	87	193	40	1
Desert land:								
Originals.....	405	689	.....	3	1,091	1,094	.....	.....
Finals.....	98	49	.....	6	114	120	27	.....
Timber culture:								
Originals.....	4	.....	.....	.....	.....	.....	4	.....
Finals.....	2	.....	.....	.....	.....	.....	2	.....
Timber and stone:								
Originals.....	770	92	.....	22	124	146	716	10
Finals.....	51	151	86	4	26	116	86	.....
Isolated tracts:								
Originals.....	168	40	.....	1	46	47	161	.....
Cash.....	76	183	19	.....	125	144	115	.....
Mineral:								
Applications.....	461	112	.....	1	134	135	438	4
Entry.....	42	110	.....	.....	116	116	36	5
• Soldiers' additional.....	468	327	284	120	.....	404	391	.....
Selections:								
State.....	1,667	524	.....	.....	730	730	1,461	134
Forest.....	165	90	.....	.....	178	178	77	5
Railroad.....	377	130	.....	.....	116	116	391	7
Indian allotments.....	610	315	.....	.....	909	909	16	.....
Squatter claims.....	48	.....	.....	.....	.....	.....	48	.....
Mineral locations.....	100	.....	.....	.....	1	1	99	.....
Total.....	14,738	19,529	3,991	561	14,491	19,043	15,224	432

Indictments, convictions, acquittals, and dismissals, fines imposed, paid, and prison sentences, June 30, 1919, to June 30, 1920.

Offense.	Indict- ments.	Convic- tions.	Prison sentence.	Fines im- posed.	Fines paid.	Acquit- tals and dismiss- als.
Timber trespass.....	3	1	1	.....	.....	1
Conspiracy.....	16	8	.....	\$2,301.00	\$651.00	2
Perjury.....	16	8	3	700.00	150.00	4
Inclosure.....	2	.....	.....	.....	.....	.....
Section 215, Penal Code.....	2	7	2	3,250.00	.....	7
Section 37, Penal Code.....	.....	2	1	3,500.00	1,000.00	6
Fraudulent location.....	1	1	.....	250.00	.....	.....
Section 19, Penal Code.....	3	2	.....	.....	.....	1
Section 28, Penal Code.....	5	2	.....	200.00	200.00	2
Embezzlement.....	2	1	1	2,662.67	.....	.....
Falsification official records.....	1	1	.....	100.00	100.00	.....
False report to purchasers.....	1	.....	.....	.....	.....	.....
Subordination perjury.....	.....	.....	.....	.....	.....	1
Mislocating settlers.....	3	.....	.....	.....	.....	2
Impersonating agent.....	2	1	1	.....	.....	.....
Submitting false account.....	1	.....	.....	.....	.....	.....
Conspiracy to prevent enjoyment of civil rights.....	.....	2	2	600.00	.....	3
Total.....	58	36	11	13,563.67	2,101.00	29

Class, number, and area of patents issued during fiscal year ended June 30, 1920.

Class.	No.	Area.	Class.	No.	Area.
		<i>Acres.</i>			<i>Acres.</i>
Commuted homestead.....	1,910	233,594.720	Railroad.....	45	527,640.850
Timber and stone.....	660	72,302.610	Private land claim.....	23	8,631.840
Public sale.....	2,744	213,685.510	Small holding claim.....	175	7,700.310
Cash miscellaneous.....	414	27,171.520	Swamp.....	15	13,710.375
Desert land.....	1,683	276,428.300	Umatilla Indian land.....	9	918.300
Desert-land reclamation.....	4	370.000	Abandoned military reservation.....	57	4,625.110
Desert-land segregation.....	6	15,420.890	Choctaw lands.....	4	2,037.220
Town site.....	4	674.288	Cemetery site.....	8	203.150
Town lot.....	1,589	480.675	Mission site.....	1	7.650
Homestead.....	38,762	9,239,903.257	Villa site.....	62	220.540
Forest homestead.....	2,447	285,640.720	Sioux half-breed scrip.....	2	197.950
Reclamation homestead.....	923	67,766.490	Valentine scrip.....	3	90.460
Soldier's additional homestead.....	284	11,666.546	Wyandotte scrip.....	1	39.970
Stock raising homestead.....	1,411	376,065.710	Wagon road.....	1	560.000
Forest lieu selection.....	84	30,675.620	Indian.....	10,589	181,703.545
Military bounty land warrant.....	36	962.700	Special acts.....	1,149	193,212.437
Mineral.....	422	52,897.594	Supplemental patents, 4-14-14.....	158	(*)
Coal.....	28	3,194.480			
Coal deposits.....	21	(1)	Total.....	65,734	11,850,401.337

¹ Surface area reported elsewhere, 1,485.66.

² Area of supplemental patents, act Apr. 14, 1914, 22,269.38.

	<i>Acres.</i>
Patented area under enlarged-homestead act.....	6,773,832.75
Patented area under Kinkaid Act.....	201,317.66
Patented area coal reserved.....	1,111,990.83
Patented area act July 17, 1914, phosphate, etc.....	153,135.46
All included in the above report.....	
Area of Indian fee patents not included in above report.....	1,138,023.08 ¹

	Pending June, 1920.			
	Referred to other divisions.	Total.	For office action.	For action elsewhere.
Cases of all kinds.....	49,976 30,422 34,263 42,608 35,938 35,605 33,539 62,709 46,215 32,350 33,280 38,018	73,116 50,017 54,637 70,469 57,661 55,805 59,690 87,976 73,195 60,208 57,209 66,378		
Total.....	474,920	766,351	42,648	43,746
			42,648	43,746
				86,394

Railroad and wagon roads.....	2,249.03 21,392.41 3,628.45 46,258.84 1,091,699.64 13,598.50 135,065.33 19,836.62 2,021.72 11,128.13 32,733.44	89,854.44 95,711.36 8,463.36 187,576.77 1,094,863.37 14,224.53 26,254.87 138,653.20 44,541.53 20,464.23 12,248.13 202,986.15			
Total.....	1,379,601.11	1,935,841.94	193,629.83	2,531,068.85	2,724,698.68
State.....	110,023.37 75,060.00 62,591.65 86,252.56 163,680.24 50,084.04 102,979.28 194,740.37 71,075.94 50,817.91 68,738.53 121,156.64	119,504.33 173,353.49 154,585.94 212,712.60 297,644.42 88,482.00 292,320.75 312,395.28 206,047.06 232,567.71 199,572.59 415,912.13			
Total.....	1,157,200.53	2,705,098.30	988,354.36	2,245,665.26	3,234,019.62
Miscellaneous.....	4,954.43 594.72 260.18 720.00 683.60 1,393.80 10,160.00 12,044.00	384.46 21,657.02 1,538.66 25,824.64 324,277.12 3,786.66 94,789.29 1,203.60 31,114.29 6,915.06 22,750.86 14,671.73			
Total.....	30,810.73	548,913.39	273,009.10	1,493,046.13	1,766,055.23
Carey Act segregation.....		678.32 17,725.13 4,283.31			
Total.....		22,684.76	598,991.74	458,041.29	1,057,033.03
Aggregate.....	2,567,612.37	5,212,538.39	2,053,985.03	6,727,821.53	8,781,806.56

Area by office of entries patented during the fiscal year ended June 30, 1920.

State.	Office.	Area.	State.	Office.	Area.
		<i>Acres.</i>			<i>Acres.</i>
Alabama.....	Center.....	120,280	Montana.....	Helena.....	227,525,168
	Demopolis.....	814,460		Kaliapell.....	70,296,803
	Montgomery.....	20,405,270		Lewistown.....	424,146,727
Alaska.....	Fairbanks.....	2,924,875		Miles City.....	758,768,314
	Juneau.....	11,728,635		Missoula.....	75,983,244
	Nome.....	1,655,660		(1)	5,187,210
Arizona.....	Phoenix.....	226,435,508	Nebraska.....	Alliance.....	86,788,490
	(1)	29,507,220		Broken Bow.....	100,387,850
Arkansas.....	Camden.....	13,142,415		Lincoln.....	7,954,690
	Champagnolle.....	40,000		North Platte.....	1,863,610
	Harrison.....	46,200,270		O'Neill.....	802,190
	Little Rock.....	60,211,540	Nevada.....	Valentine.....	55,637,710
	Washington.....	80,000		Carson City.....	68,146,640
	(1)	1,990		Elko.....	32,744,635
California.....	El Centro.....	17,639,490		(1)	1,598,610
	Eureka.....	12,445,800	New Jersey.....	General L a n d	25,090
	Independence.....	29,421,964		Office.	
	Los Angeles.....	203,063,733	New Mexico.....	Clayton.....	248,779,690
	Sacramento.....	65,872,620		Fort Sumner.....	118,277,020
	San Francisco.....	83,030,414		Las Cruces.....	69,558,144
	Susanville.....	31,381,127		Roswell.....	167,486,552
	Visalia.....	62,383,460		Santa Fe.....	272,529,760
	(1)	10,155,590		Tucumcari.....	111,617,400
Colorado.....	Del Norte.....	15,294,460		(1)	63,695,100
	Denver.....	160,793,655	North Dakota.....	Bismarck.....	23,223,000
	Durango.....	54,720,776		Dickinson.....	106,228,330
	Glenwood Springs.....	136,417,760		Minot.....	71,678,798
	Hugo.....	47,732,240		Williston.....	69,192,910
	Lamar.....	605,873,050		(1)	590,400
	Leadville.....	11,195,384	Oklahoma.....	Guthrie.....	80,510,724
	Montrose.....	58,756,170		Lawton.....	160,000
	Pueblo.....	553,604,505	Oregon.....	Burns.....	71,543,720
	Sterling.....	348,631,170		La Grande.....	81,997,120
Florida.....	Gainesville.....	36,230,267		Lakeview.....	55,350,950
Idaho.....	Blackfoot.....	316,346,579		Portland.....	14,606,977
	Boise.....	126,767,862		Roseburg.....	28,036,351
	Coeur d'Alene.....	27,345,966		The Dalles.....	140,343,370
	Hailey.....	184,828,853		Vale.....	78,462,010
	Lewiston.....	35,134,822		(1)	14,514,050
	(1)	440,000	South Dakota.....	Bellefourche.....	129,182,343
Illinois.....	General land	248,310		Gregory.....	108,172,190
	office.			Lemmon.....	175,045,070
	Vandalia.....	80,000		Pierre.....	58,189,730
Indiana.....	Crawfordsville.....	40,000		Rapid City.....	110,653,036
	General land	120,000		Timber Lake.....	68,121,230
	office.			Watertown.....	78,440
Iowa.....	Burlington.....	3,730		(1)	15,275,070
	General land	40,000	Utah.....	Salt Lake City.....	207,386,900
	office.			Vernal.....	12,596,484
Kansas.....	Dodge City.....	53,030,980		(1)	880,000
	Topeka.....	55,296,140	Washington.....	Olympia.....	160,000
Louisiana.....	Baton Rouge.....	23,009,385		Seattle.....	11,916,402
	Natchitoches.....	5,000		Spokane.....	48,031,912
	New Orleans.....	40,000		Vancouver.....	19,451,970
	Opelousas.....	40,000		Walla Walla.....	29,477,520
	Ouachita.....	713,850		Waterville.....	61,168,112
Michigan.....	Marquette.....	8,781,980		Yakima.....	19,375,887
Minnesota.....	Cass Lake.....	143,730,710		(1)	6,759,285
	Crookston.....	96,813,640	Wisconsin.....	Stevens Point.....	120,000
	Duluth.....	22,730,450		Wausau.....	4,872,810
	(1)	1,111,400		(1)	32,009,630
Mississippi.....	Jackson.....	19,497,970	Wyoming.....	Buffalo.....	150,057,160
	Pontotoc.....	320,900		Cheyenne.....	339,787,581
	(1)	2,037,220		Douglas.....	153,913,283
Missouri.....	Ironton.....	119,470		Evanston.....	50,002,582
	Springfield.....	4,073,600		Lander.....	45,559,510
Montana.....	Billings.....	207,263,778		Newcastle.....	7,405,310
	Bozeman.....	270,421,983		Sundance.....	258,159,460
	Glasgow.....	660,410,026			
	Great Falls.....	242,954,855	Total.....		11,860,401,337
	Havre.....	458,441,806			

1 Indian and private land grants.

Consolidated work report of local land offices for fiscal year 1920.

Office.	Cases pending and received.			Cases disposed of.				Pending June 30, 1920.
	Pending Jan. 1, 1920.	Received.	Total.	Transmitted on appeal.	Transmitted otherwise.	Referred to Chief of Field Division.	Total.	
Alabama:								
Montgomery.....	95	638	733	100	427	.....	527	206
Alaska:								
Fairbanks.....	10	150	160	.....	33	119	152	8
Juneau.....	85	1,224	1,309	.....	1,116	36	1,152	157
Arizona:								
Phoenix.....	1,205	7,061	8,266	43	6,823	563	7,429	837
Arkansas:								
Camden.....	22	517	539	3	444	58	505	34
Harrison.....	92	1,907	1,999	6	1,896	20	1,922	77
Little Rock.....	70	1,980	2,000	25	1,724	85	1,834	166
California:								
El Centro.....	20	1,187	1,207	9	697	119	825	282
Eureka.....	158	390	538	159	171	.....	330	208
Independence.....	221	848	1,069	.....	780	80	860	209
Los Angeles.....	251	2,182	2,433	44	2,091	89	2,224	209
Sacramento.....	692	1,557	2,249	9	1,597	195	1,801	448
San Francisco.....	611	1,676	2,287	197	1,427	154	1,778	509
Susanville.....	345	788	1,133	3	763	79	845	288
Visalia.....	594	1,322	1,916	.....	1,132	35	1,167	749
Colorado:								
Del Norte.....	166	625	791	38	585	15	638	153
Denver.....	565	1,831	2,396	12	2,010	93	2,115	281
Durango.....	385	1,328	1,713	13	1,326	55	1,394	319
Glenwood Springs.....	2,111	3,870	5,981	67	2,046	149	3,162	2,819
Hugo.....	61	331	392	.....	366	7	373	19
Lamar.....	377	4,545	4,922	104	4,191	124	4,419	508
Leadville.....	384	1,051	1,435	.....	1,097	25	1,122	313
Montrose.....	739	1,647	2,386	21	1,838	90	1,949	437
Pueblo.....	2,772	6,145	8,917	35	5,602	98	5,735	3,182
Sterling.....	238	1,832	2,070	16	1,779	22	1,817	253
Florida:								
Gainesville.....	36	986	1,022	24	888	63	975	47
Idaho:								
Blackfoot.....	2,514	3,527	6,041	83	4,469	147	4,699	1,342
Boise.....	1,184	2,534	3,718	87	2,616	79	2,782	936
Coeur d'Alene.....	30	652	682	4	559	2	565	117
Halley.....	1,087	2,261	3,298	69	2,277	133	2,484	814
Lewiston.....	106	468	574	3	484	13	500	74
Kansas:								
Topeka.....	58	706	764	13	620	14	647	117
Louisiana:								
Baton Rouge.....	29	917	946	7	764	94	865	81
Michigan:								
Marquette.....	2	297	299	3	267	6	276	23
Minnesota:								
Cass Lake.....	927	850	1,777	2	1,648	2	1,652	125
Crookston.....	324	1,233	1,557	2	1,213	12	1,227	330
Duluth.....	27	441	468	1	427	6	434	34
Mississippi:								
Jackson.....	14	564	578	11	481	68	560	18
Missouri:								
Springfield.....	5	59	64	.....	63	.....	63	1
Montana:								
Billings.....	232	1,261	1,493	.....	1,310	6	1,316	177
Boreman.....	615	1,471	2,086	21	1,561	35	1,617	499
Glasgow.....	1,809	5,682	7,491	203	5,816	237	6,256	1,235
Great Falls.....	787	2,403	3,190	41	2,430	48	2,519	671
Haure.....	1,478	6,057	7,535	144	6,433	98	6,675	890
Helena.....	1,375	2,927	4,302	69	2,907	115	3,091	1,211
Kalispell.....	35	996	1,081	.....	1,004	2	1,006	25
Lewistown.....	1,632	3,896	5,514	53	3,700	480	4,233	1,281
Miles City.....	3,661	6,858	10,519	31	6,975	198	7,204	3,315
Missoula.....	191	856	1,047	7	955	17	969	88
Nebraska:								
Allamore.....	54	980	1,034	20	777	109	906	123
Broken Bow.....	66	484	550	1	436	38	475	75
Lincoln.....	10	189	199	2	170	22	194	5
Nevada:								
Carson City.....	245	1,406	1,651	27	1,199	86	1,312	339
Eiko.....	124	666	790	4	614	17	635	155

Consolidated work report of local land offices for fiscal year 1920—Continued.

Office.	Cases pending and received.			Cases disposed of.				Pending June 30, 1920.
	Pending Jan. 1, 1920.	Received.	Total.	Transmitted on appeal.	Transmitted otherwise.	Referred to Chief of Field Division.	Total.	
New Mexico:								
Clayton.....	490	2,291	2,771	40	2,079	70	2,189	582
Fort Sumner.....	341	1,471	1,812	7	1,508	16	1,526	286
Las Cruces.....	1,139	3,044	4,183	62	2,188	25	2,275	1,908
Roswell.....	1,709	3,299	5,008	99	3,583	12	3,664	1,344
Santa Fe.....	2,301	4,177	6,478	52	3,482	33	3,567	2,911
Tucumcari.....	271	1,026	1,297	28	951	31	1,010	287
North Dakota:								
Bismarck.....	97	409	506	13	448	6	467	39
Dickinson.....	302	846	1,148	62	885	22	969	179
Minot.....	77	640	717	9	629	10	648	69
Williston.....	101	760	861	3	784	2	789	72
Oklahoma:								
Outhrie.....	130	1,132	1,262	37	995		1,032	230
Oregon:								
Burns.....	599	791	1,390	16	1,042	59	1,117	273
La Grande.....	1,057	1,658	2,715	6	1,935	175	2,116	599
Lakeview.....	233	703	936	19	617	78	712	224
Portland.....	161	688	849	8	744	15	767	82
Roseburg.....	48	1,348	1,396	44	1,248	4	1,296	100
The Dalles.....	1,487	2,059	3,546	36	2,230	161	2,427	1,119
Vale.....	496	1,348	1,846	3	1,238	98	1,339	507
South Dakota:								
Bellefourche.....	1,036	1,579	2,615	13	2,052	46	2,111	504
Gregory.....	94	356	450	60	233	20	313	137
Lemmon.....	300	1,694	1,994	12	1,680	28	1,730	274
Pierre.....	229	1,124	1,353	6	742	309	1,057	296
Rapid City.....	1,744	2,286	4,030	31	2,400	51	2,482	1,548
Timber Lake.....	540	2,474	3,014	6	1,016	1	1,023	1,991
Utah:								
Salt Lake City.....	1,819	3,918	5,737	2	3,445	128	3,575	2,162
Vernal.....	68	468	536		482	9	491	45
Washington:								
Seattle.....	1	228	229	4	216	3	223	6
Spokane.....	141	793	934	8	747	25	780	154
Vancouver.....	45	262	307	1	271	1	273	34
Walla Walla.....	194	438	632	1	478	19	298	134
Waterville.....	406	1,150	1,555	20	1,099	78	1,197	358
Yakima.....	141	431	572	5	443	3	451	121
Wisconsin:								
Wausau.....	14	229	243	2	233	4	239	4
Wyoming:								
Buffalo.....	1,986	4,448	6,434	51	4,900	96	5,047	1,387
Cheyenne.....	1,620	5,299	6,919	58	5,186	111	5,355	1,664
Douglas.....	3,570	6,621	10,191	28	7,446	165	7,639	2,552
Evanston.....	293	1,090	1,373	11	968	72	1,051	322
Lander.....	407	2,009	2,416	21	1,890	59	1,969	447
Newcastle.....	2,397	5,635	8,032	152	5,916	143	6,211	1,821
Total.....	58,947	168,401	227,348	2,842	164,327	6,648	173,817	53,531

State.	Total number of acres approved.						
	1915	1916	1917	1918	1919	1920	Total.
Alaska.....	195,143.65	357,631.85	120,272.34	236,905.05	135,536.67	126,857.39	1,172,246.95
Arizona.....	1,749,096.67	1,117,183.66	1,336,531.34	2,117,525.00	3,423,481.77	1,315,242.58	11,059,040.01
California.....	1,407,004.76	231,405.98	341,694.53	517,531.44	585,984.64	497,572.24	11,600,535.59
Colorado.....	823,215.00	438,631.00	800,621.00	581,301.00	668,717.00	401,154.57	3,513,641.57
Idaho.....	1,347,640.01	1,147,382.83	1,212,060.13	783,694.03	613,889.68	235,210.73	5,239,799.29
Montana.....	2,166,640.20	1,541,046.96	1,147,382.83	2,231,252.73	1,235,908.14	621,031.36	10,056,673.05
Nebraska.....	2,645,060.00	1,332,994.00	2,261,868.02	2,297,448.00	1,264,383.64	204,817.51	4,639,942.05
Nevada.....	564,781.86	475,206.96	1,221,634.72	307,248.00	456,265.68	7,230,867.46	3,230,867.46
New Mexico.....	2,200,036.34	1,628,412.03	824,265.98	1,162,738.36	1,604,947.51	491,072.62	7,911,472.84
Oregon.....	573,967.66	421,980.52	264,071.23	1,442,200.32	1,112,331.23	257,643.12	2,072,144.06
South Dakota.....	22,817.07	756,286.87	837,654.43	78,692.74	48,375.05	317,784.58	1,149,884.86
Utah.....	1,034,133.65	172,847.31	209,529.64	387,361.60	432,980.76	190,426.00	3,765,601.89
Washington.....	1,140,425.38	467,753.00	921,638.00	172,104.59	179,043.47	190,426.00	1,064,378.39
Wyoming.....	522,670.00	87,690.63	968,279.76	707,902.00	479,017.00	252,028.40	3,351,006.40
Commissioner General Land Office.....	911,517.70			5,673.00	211,080.96	113,142.20	2,277,353.95
Total.....	13,103,049.04	10,176,353.59	12,214,106.02	10,029,509.86	11,351,954.68	5,220,719.54	62,104,692.73

State.	Mineral surveys approved.						
	1915	1916	1917	1918	1919	1920	Total.
Alaska.....	61	236	81	49	174	169	892
Arizona.....	61	232	75	94	379	36	254
California.....	63	160	151	60	194	133	638
Colorado.....	86	206	142	82	210	34	524
Idaho.....	28	128	105	41	173	43	333
Montana.....	106	208	259	141	273	28	465
Nevada.....	44	187	138	33	129	49	181
New Mexico.....	50	98	153	39	136	230	783
Oregon.....	14	66	20	4	16	69	1,218
South Dakota.....	5	17	6	4	3	2	607
Utah.....	45	90	115	64	32	2	363
Washington.....	8	19	16	9	12	23	123
Wyoming.....	10	68	67	1	1	6	120
Total.....	581	1,725	1,715	611	1,831	477	10,339

Statement showing output of work in offices of United States surveyors general, fiscal years 1915 to 1920—Continued.

State.	Forest homestead surveys approved.						Supplemental, segregation, and amended plats prepared.							
	1915	1916	1917	1918	1919	1920	Total.	1915	1916	1917	1918	1919	1920	Total.
Alaska.....	44	39	113	13	5	21	39	21	45	66	36	3	28	3
Arizona.....	20	68	118	141	16	91	444	57	99	142	122	60	117	256
California.....	13	66	65	17	34	54	255	155	183	121	97	56	135	719
Colorado.....	57	140	127	103	29	60	506	45	81	102	64	52	98	442
Idaho.....	106	130	186	94	82	71	669	42	76	66	168	99	158	609
Montana.....	9	22	31	4	40	15	121	3	6	3	9	6	6	27
Nevada.....	26	35	117	67	63	33	315	12	54	36	8	27	20	157
New Mexico.....	28	30	38	17	12	21	144	48	30	57	38	43	165	381
Oregon.....	36	108	122	13	57	55	391	12	22	39	59	70	70	206
South Dakota.....	21	6	22	17	7	26	99	18	16	39	14	5	18	110
Utah.....	13	42	72	36	18	6	187	100	92	230	132	66	67	687
Washington.....	18	37	17	10	33	1	116	46	43	103	7	12	33	244
Wyoming.....														
Total.....	363	723	928	555	415	445	3,429	559	717	1,004	699	599	980	4,558

State.	Moneys earned for copies of records.					Total.								
	1915	1916	1917	1918	1919	1920	Total.	1915	1916	1917	1918	1919	1920	Total.
Alaska.....	\$120.75	\$121.15	\$211.45	\$122.55	\$44.85	\$281.15	\$901.90							
Arizona.....	272.40	423.10	311.25	251.70	577.35	294.80	2,220.60							
California.....	736.90	931.35	1,114.06	1,101.80	1,007.75	1,892.15	6,794.00							
Colorado.....	743.70	748.40	643.00	709.00	666.50	1,315.25	3,211.85							
Idaho.....	178.95	357.09	409.11	312.00	892.63	1,062.10	3,211.88							
Montana.....	764.30	798.55	788.05	670.80	595.75	789.75	4,407.20							
Nevada.....	547.10	481.50	487.95	370.75	531.95	837.05	3,256.50							
New Mexico.....	517.00	96.75	113.00	219.30	221.75	207.85	1,860.55							
Oregon.....	290.85	605.25	223.85	243.80	208.05	241.45	1,880.85							
South Dakota.....	63.60	94.55	270.11	40.30	102.45	58.95	2,060.05							
Utah.....	138.65	278.55	270.11	448.50	395.85	518.40	2,060.05							
Washington.....	666.75	546.95	533.20	550.45	564.70	707.60	3,569.65							
Wyoming.....	109.24	125.15	164.25	376.10	207.70	436.78	1,418.72							
Total.....	4,706.09	5,608.64	5,409.52	5,417.05	6,065.78	8,722.78	35,983.86							

Expenditures during the fiscal year ended June 30, 1920, in connection with surveying activities.

	Salaries of offices of surveyors general.	Contingent expenses, offices of surveyors general.	Surveying the public lands.	Deposits by individuals for surveying public lands.	Surveying within land grants (claimable).	Miscellaneous. ¹	Indian surveys.	Total.
Alaska ²	\$12,801.12	\$2,024.33	\$43,700.32	\$1,321.00	.....	\$1,000.50	.....	\$61,807.36
Arizona.....	14,156.62	275.05	35,277.12	5,749.56	.....	8,968.17	.....	89,739.92
California.....	16,898.66	474.66	52,392.54	4,514.52	10,525.64	4,465.52	\$20,550.80	92,110.19
Colorado.....	22,978.68	590.05	56,528.42	3,462.39	.....	5,795.15	2,838.35	89,499.02
Idaho.....	12,284.54	373.50	37,922.96	1,405.86	.....	3,467.57	144.33	56,413.83
Montana.....	18,174.33	271.55	69,627.20	22,266.77	169.47	4,482.02	869.40	118,199.37
Nebraska ³.....	.....	.....	30,032.47	.....	.....	4,919.09	3,108.03	34,951.56
Nevada.....	11,322.49	150.50	33,609.83	3,743.69	.....	2,126.46	834.75	51,787.72
New Mexico.....	20,262.95	699.55	47,316.80	828.03	.....	4,151.77	14,997.97	88,257.07
..... region.....	13,212.97	236.88	46,094.17	13.75	.....	3,081.25	6,145.76	68,784.78
South Dakota.....	4,854.11	11.40	.....	58.33	.....	572.67	.....	5,523.51
Utah.....	13,576.53	314.54	46,413.74	5,235.95	.....	2,823.98	2,642.35	71,007.09
Washington.....	12,468.99	194.90	57,316.82	9,704.85	148.17	3,692.76	8,496.20	92,012.69
Wyoming.....	12,466.62	189.36	39,839.13	530.38	.....	2,915.32	.....	55,940.81
General Land office ³	58.66	4,021.29	63,585.21	54,847.40	1,156.83	3,776.62	26,718.72	154,164.73
Total.....	185,617.27	9,827.56	659,656.73	113,806.87	16,742.71	57,218.85	87,326.66	1,130,199.65

¹ Includes "Increase of compensation, Interior Department," "Special deposits, resurveys, act of Sept. 21, 1918," "California private lands, act of Mar. 2, 1917," "Appraisal and sale of abandoned military reservations," and "Completing surveys within railroad land grants."

² Includes expenditures by others than surveyors general.

³ Includes expenditures by Frank A. Lewis.

Sales of Indian lands during fiscal year ended June 30, 1920.

Land offices and Indian tribes.	Entries and segregations.				Receipts, sales, and interest.
	Number.		Acres.		
	Original.	Final.	Original.	Final.	
Arizona:					
Phoenix.....					\$1,044.21
California:					
El Centro—Yuma.....	1	13	40.00	545.99	4,674.59
Eureka—Round Valley.....		18		2,520.00	4,332.75
San Francisco—Round Valley.....		96		14,612.22	13,716.91
Colorado:					
Durango—Ute, acts June 15, 1880, and July 28, 1882.....	129	55	27,937.01	8,408.15	5,896.70
Southern Ute, act Feb. 20, 1895.....	129	102	44,706.61	17,079.63	3,310.13
Glenwood Springs—Ute, acts June 15, 1880, and July 28, 1882.....	316	206	77,772.60	29,368.41	23,151.53
Montrose—Ute, acts June 15, 1880, and July 28, 1882.....	20	42	5,964.32	4,723.19	19,772.33
Idaho:					
Blackfoot—					
Town lots, Pocatello.....		16			2,980.00
Coeur d'Alene—					
Act June 21, 1906.....	8	16	1,094.79	1,948.63	1,823.61
Town lots.....	97	115			4,100.37
Kansas:					
Topeka—Osage.....		8		497.88	1,081.40
Minnesota:					
Cass Lake—Chippewa.....	706	1,538	102,291.21	118,010.78	140,309.50
Crookston—					
Chippewa.....	450	656	61,899.27	92,977.48	104,937.62
Red Lake.....	2	13	52.00	1,332.00	8,210.24
Duluth—Chippewa.....	13	21	1,436.92	1,946.68	3,157.96
Montana:					
Billings—Crow.....	12	192	2,271.53	56,590.18	109,124.78
Town lots.....	2	17			4,382.86
Glasgow—Fort Peck.....	95	368	21,328.78	76,284.18	281,511.83
Town lots.....		39			
Ka'ispall—Flathead.....	8	19	495.84	1,946.48	10,777.76
Blackfeet.....					20,448.55
Town lots.....	341	204			16,876.79
Villa sites.....	8	71			
Missoula—Flathead.....	8	46	499.69	4,470.01	16,190.51
Town lots.....	53	135			11,467.55
Sales, timber lands.....					1,194.47
North Dakota:					
Bismarck—Standing Rock.....	12	4	1,528.31	987.72	20,435.54
Standing Rock and Cheyenne.....	13	26	3,317.47	5,816.40	
Minot—Devils Lake.....	5	18	317.56	565.51	1,764.93
Fort Bertholdt, act June 1, 1910.....	18	233	2,161.33	34,679.13	131,188.02
Town lots.....		54			2,232.80
Oklahoma:					
Guthrie—Cheyenne and Arapahoe.....		7		560.00	27,648.28
Kiowa, Comanche, and Apache.....	6	106	956.64	15,682.83	384,294.55
Lawton town lots.....		44			7,048.81
Hospital fund.....					5,588.63
Wichita.....					206.30
Oregon:					
La Grande—Umatilla.....	5	35	233.07	3,023.03	279.39
Portland—Siletz.....					11,214.32
South Dakota:					
Gregory—Rosebud.....	39	195	6,717.07	34,300.36	41,320.82
Pine Ridge.....	79	109	29,158.53	25,182.71	29,178.52
Town lots.....		28			
Lemmon—Standing Rock.....	219	205	37,069.64	38,890.66	95,642.94
Pierre—Lower Brule.....		1		160.00	73.60
Timber Lake—Cheyenne River.....	1,374	344	192,218.41	63,918.23	354,182.00
Standing Rock.....	242	20	38,548.35	16,259.29	63,066.81
Town lots.....	62	89			5,862.75
Utah:					
Vernal—Uintah.....	19	58	2,367.31	6,961.03	8,867.85
Town lots.....		162			11,141.30
Washington:					
Spokane.....		1		40.00	266.50
Colville.....	134	71	21,582.20	30,752.11	13,366.63
Town lots.....	79	25			
Waterville—Colville.....	64	82	13,693.07	16,101.86	26,311.73
Town lots.....	187	15			5,955.50
Wyoming:					
Lander—Shoshone.....	11	23	1,352.85	2,061.59	1,633.60
Total.....	4,938	6,031	699,012.38	729,204.29	2,063,186.06

¹ Moneys received for these town lots and villa sites included in aggregate "Receipts, sales, and interest" for each reservation period.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920.

Location.	Number of appli- cations, entries, etc. (origi- nal and final).	Area.			Receipts for allowed applications and entries. ¹				Expenses.				
		Entered.		Patented.	Fees and commissions.		Purchase money.	Indian. ²	Total earnings. ³	Salaries and com- missions, registers and re- ceivers.	Incl. dental.	Total.	
		Original.	Final.		Indian lands.	Public lands.							
				Acres.			Acres.	Acres.					
Alabama, Montgomery	498	20,993.76	13,788.34	20,401.270		\$4,204.25	\$10,328.88	\$14,533.13		\$14,797.73	\$3,803.83	\$1,907.20	\$5,711.03
Alaska.													
Fairbanks.	26	2,330.03	2,192.72	2,924.875		246.05	262.50	509.15		8,426.12	324.83	2,581.67	2,893.50
Juneau.	283	10,367.15	11,159.61	11,728.635		1,831.08	6,965.11	8,816.19		31,991.24	3,374.91	3,956.54	6,956.54
Nome.	34	1,433.55	1,433.55	1,855.600		106.60	3,617.50	3,724.10		9,489.23	310.86		310.86
Arizona, Phoenix.	4,317	1,831,724.30	180,267.38	226,435.508		55,911.56	87,688.43	143,599.99		187,329.50	6,000.00	11,108.37	17,108.37
Indian and private land grants.													
Arkansas.				29,507.220									
Camden.	295	11,722.37	10,867.56	13,142.415		2,283.04	6,375.46	8,658.50		7,973.33	2,474.78	1,828.60	4,303.38
Harrison.	940	38,006.82	39,186.07	46,200.270		5,894.77	5,295.81	11,190.58		11,386.79	3,988.54	2,930.75	6,919.29
Little Rock.	1,066	41,670.33	54,073.04	60,211.540		7,191.70	17,248.71	24,440.41		18,988.68	5,197.85	4,615.75	9,813.60
Indian and private land grants.				1.990									
California.													
El Centro.	369	174,438.11	14,425.15	17,639.490	\$27.88	5,498.50	12,240.92	17,757.30		4,674.59	6,000.00	4,281.61	10,281.61
Eureka.	244	17,067.94	10,991.40	12,445.800		2,388.99	6,666.92	9,055.91		4,352.75	2,844.56	10.00	2,854.56
Independence.	496	77,963.30	28,624.17	29,421.964		7,086.58	14,919.22	22,005.80		32,127.40	5,769.91	1,185.57	6,955.48
Los Angeles.	1,286	117,375.49	82,530.86	203,083.733		16,088.51	23,507.78	39,596.29		51,377.56	6,000.00	10,404.13	16,404.13
Sacramento.	1,212	176,641.74	59,345.89	65,872.620		19,418.42	18,254.27	37,672.69		37,513.77	5,866.66	3,800.17	9,366.83
San Francisco.	1,033	177,008.43	55,164.87	83,080.414	6.00	15,111.84	16,387.02	31,604.86		13,716.91	6,000.00	4,473.25	10,473.25
Susanville.	449	71,628.06	31,062.17	31,381.127		6,442.00	7,456.51	13,898.51		16,426.28	5,337.18	1,963.95	7,501.13
Visalia.	792	101,424.70	67,511.12	62,383.460		12,266.33	9,861.24	22,097.57		22,337.75	6,000.00	4,443.84	10,443.84
Indian and private land grants.				10,155.590									
Colorado.													
Del Norte.	425	96,795.11	14,836.02	15,294.460		6,396.93	7,157.43	13,554.35			5,583.85	329.45	57913.30
Denver.	1,542	113,172.99	151,101.41	160,738.655		21,582.21	36,776.63	58,358.84		60,790.90	6,000.00	5,008.69	11,008.69
Durango.	462	79,328.78	14,297.75	54,720.776		6,666.81	9,711.04	22,308.48		29,184.52	6,000.00	2,747.33	8,747.33
Glenwood Springs.	1,550	228,858.52	81,524.43	136,417.760		21,023.41	30,092.80	57,752.29		74,349.96	6,000.00	5,802.68	11,802.68
Hugo.	283	10,697.95	38,968.58	47,732.240		3,859.69	1,154.91	5,014.60		5,054.10	4,282.54	2,523.00	6,805.54
Lamar.	2,854	187,973.33	568,635.01	603,873.070		42,144.64	9,629.21	52,073.85		59,474.18	6,000.00	6,050.59	12,060.59

¹ Moneys reported under the heading "Receipts for allowed applications and entries" may in several cases exceed the total earnings from all sources for an individual office. This is due to the fact that lands are considered entered only when a certificate of allowance issues. The receipts where the receipts for "Allowed applications and entries" exceed the total earnings of an office include allowances during the fiscal year 1920, whereas its moneys were accounted for and reported as earned during the preceding fiscal year irrespective of whether the papers ever become an entry. This table does not include number and area of Indian lands. See Indian table.

² These columns embrace moneys that are credited to the United States; for detailed earnings see following table.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

Location.	Number of appli- cations, entries, etc. (original and final).	Area.		Patented.	Receipts for allowed applications and entries.			Indian.	Total earnings.	Expenses.			
		Entered.			Fees and commissions.					Salaries and commissions, registers and re- ceivers.	Incl. dental.	Total.	
		Original.	Final.		Indian lands.	Public lands.	Purchase money.						Total.
Colorado—Continued.													
Leadville.....	647	172,924.21	10,990.82	Acres.	11,195.384	\$12,240.10	\$7,023.83	\$19,285.38	\$19,167.33	\$6,000.00	\$64.50	\$6,064.50	
Montrose.....	1,274	280,116.63	53,896.79	58,756.170	21,199.74	14,973.68	36,447.92	49,439.33	6,000.00	4,711.33	10,711.33		
Pueblo.....	3,872	518,185.50	521,578.49	553,034.005	58,203.10	24,203.24	82,508.34	81,900.22	5,169.45	8,661.99	13,831.44		
Sterling.....	1,538	68,432.41	247,935.59	346,631.59	17,791.88	10,558.17	27,347.47	28,956.14	6,000.00	5,977.83	11,977.83		
Florida, Gainesville.....	624	28,671.83	25,906.20	36,230.267	5,463.69	11,988.17	17,451.86	17,594.33	4,307.31	4,967.25	9,474.76		
Idaho:													
Blackfoot.....	2,567	339,031.73	253,229.24	316,346.579	31,193.54	32,214.28	63,407.82	74,893.27	6,000.00	8,810.25	14,810.25		
Boise.....	1,563	252,102.30	111,853.93	126,767.862	17,419.20	45,666.61	63,105.81	69,398.57	6,000.00	5,179.00	11,179.00		
Coeur d'Alene.....	203	6,470.13	8,839.65	27,345.966	2,116.45	7,238.98	9,535.66	15,737.21	3,018.70	2,261.75	5,290.45		
Hailey.....	1,629	263,899.41	118,663.16	184,828.633	23,763.33	20,549.44	44,312.77	57,534.06	6,000.00	6,130.50	12,130.50		
Lewiston.....	384	32,616.76	31,714.74	35,134.822	4,487.88	4,506.51	8,994.49	8,617.72	3,677.15	1,614.50	5,291.65		
Indian and private land grants													
Kansas:													
Dodge City.....	88	1,737.00	17,539.59	53,080.980	887.12	100.00	987.12	322.18	751.64	632.10	1,283.74		
Topeka.....	497	13,722.36	83,203.67	56,266.140	4,963.19	2,628.08	7,591.25	8,094.65	5,371.40	2,924.41	8,305.81		
Louisiana, Baton Rouge.....	330	10,940.03	9,891.68	28,009.386	4,268.19	9,618.85	13,917.04	14,766.18	5,319.62	5,779.37	10,568.99		
Michigan, Marquette.....	170	6,562.27	6,542.24	8,781.980	1,040.46	5,416.57	7,057.03	6,708.06	2,341.28	25.00	2,366.28		
Minnesota:													
Cass Lake.....	87	1,572.51	3,984.41	143,793.710	899.19	1,203.50	14,255.73	154,630.73	6,000.00	4,453.10	10,453.10		
Crookston.....	190	11,694.60	13,660.26	96,813.640	2,211.35	13,435.95	23,660.53	136,791.39	6,000.00	2,686.00	8,686.00		
Duluth.....	301	8,662.13	9,590.19	22,730.450	1,524.51	2,456.54	4,460.76	7,685.76	2,242.62	1,820.00	4,062.62		
Indian and private land grants													
Mississippi, Jackson.....													
Indian and private land grants.....	338	11,365.11	9,731.15	19,497.970	3,270.62	13,009.12	16,279.74	16,597.66	3,595.64	2,732.02	6,327.66		
Missouri, Springfield.....													
Indian and private land grants.....	47	1,000.00	2,010.05	4,073.000	357.35	1,665.06	2,022.41	2,029.26	862.51	613.00	1,475.51		
Montana:													
Billings.....	748	56,448.96	101,837.85	207,983.778	12,788.77	1,098.58	15,987.91	133,732.28	6,000.00	4,424.00	10,424.00		
Bozeman.....	916	60,532.32	109,546.18	270,421.983	14,005.17	7,995.40	22,300.67	24,125.80	6,000.00	2,785.33	8,785.33		
Glacier.....	3,473	393,743.84	428,748.65	660,110.026	48,086.29	31,435.41	84,567.30	373,696.49	6,000.00	9,065.54	15,065.54		
Great Falls.....	1,523	73,743.09	200,659.67	242,954.653	15,344.59	25,614.96	40,959.96	41,427.23	6,000.00	7,447.25	13,447.25		
Harve.....	3,178	319,283.33	421,353.59	458,441.806	42,519.59	51,645.81	94,155.40	113,871.28	6,000.00	11,203.76	17,203.76		
Helena.....	2,012	390,402.88	138,815.43	277,526.933	33,300.42	46,410.21	80,340.63	85,242.86	6,000.00	5,393.51	11,393.51		
Kalpells.....	2,263	21,285.07	17,183.96	70,296.903	8,283.72	8,804.00	4,224.45	52,581.13	4,232.64	5,588.00	9,800.64		
Lewistown.....	2,417	223,727.65	296,074.42	424,145.727	31,135.06	40,968.96	72,104.02	79,036.04	6,000.00	9,945.35	15,945.35		

Miles City.....	4,738	655,882.78	649,370.18	758,768.314	89,491.70	51,242.03	140,733.73	139,099.53	6,000.00	11,318.66	17,318.66
Miscellaneous.....	326	31,341.59	15,129.02	75,983.244	4,857.41	8,303.96	13,352.92	42,346.86	5,537.33	2,660.00	8,227.33
Indian and private land grants.....				5,187.210							
Nebraska.....											
Allamore.....	577	25,738.42	83,543.31	86,788.490	4,553.73	24,784.84	29,338.57	29,878.90	4,608.14	3,494.61	8,100.75
Broken Bow.....	348	20,472.01	57,585.85	107,397.850	2,743.40	14,885.20	17,628.69	17,744.43	3,024.78	2,334.57	5,363.35
Lancaster.....	103	4,631.01	6,192.67	10,641.680	1,064.09	3,265.20	4,380.19	4,380.19	1,715.20	1,722.50	3,437.70
Nevada.....											
Carson City.....	574	65,458.60	16,878.80	68,146.640	6,447.64	15,011.40	21,459.04	29,434.61	5,835.92	1,779.40	7,615.32
Elko.....	445	116,835.40	26,704.86	32,744.635	6,382.61	12,288.04	18,640.65	16,299.79	5,966.13	2,422.00	8,378.13
Indian and private land grants.....											
New Jersey.....	1		25.09	1,598.610		38,100.00	38,100.00				
New Mexico.....				25,080							
Clayton.....	1,288	94,312.25	175,882.36	248,770.990	14,904.70	11,367.22	26,271.92	26,486.42	6,000.00	6,053.25	12,053.25
Fort Sumner.....	1,089	162,033.05	142,393.67	118,277.020	16,984.96	2,592.81	19,577.77	20,646.36	6,000.00	5,324.05	11,324.05
Las Cruces.....	1,268	235,254.90	69,303.88	69,558.144	16,224.38	21,071.99	37,296.37	42,005.12	6,000.00	5,741.76	11,741.76
Roswell.....	2,603	574,734.48	198,260.77	167,486.552	44,977.48	7,325.83	52,303.31	52,987.36	6,000.00	6,316.67	12,316.67
Santa Fe.....	2,729	340,760.10	267,416.27	272,559.760	34,585.89	5,664.34	40,260.23	44,819.86	6,000.00	9,389.83	15,389.83
Tucumanari.....	744	85,069.59	109,240.42	111,617.400	9,650.89	1,448.20	11,099.09	11,360.12	6,000.00	6,771.98	12,771.98
Indian and private land grants.....											
North Dakota.....				63,686.100							
Bismarck.....	274	6,027.58	20,262.01	23,223.000	2,265.01	2,057.13	4,327.28	25,337.72	3,496.26	1,347.25	4,843.51
Dickinson.....	783	64,456.53	104,726.93	106,228.330	9,546.85	2,349.56	11,896.41	12,211.13	6,000.00	2,511.09	8,511.09
Minot.....	254	5,788.75	16,823.60	71,678.798	2,053.26	6,693.34	9,866.34	144,746.15	5,666.67	1,500.00	7,166.67
Williston.....	569	19,015.31	62,137.89	66,192.91	3,769.62	1,059.78	4,829.40	5,367.40	4,193.84	1,760.00	5,953.84
Indian and private land grants.....											
Oklahoma, Guthrie.....	516	15,561.38	43,548.96	80,510.724	3,084.32	110,159.90	113,708.23	439,257.81	5,809.16	2,883.68	8,692.84
Oregon.....											
Burns.....	770	170,599.55	46,289.96	71,547.720	12,952.89	14,347.61	27,300.56	27,618.28	6,000.00	2,380.00	8,380.00
La Grande.....	1,432	213,004.76	96,591.46	191,997.130	19,577.99	42,028.97	46,606.56	47,043.19	6,000.00	4,091.50	10,091.50
Lakeview.....	576	82,935.41	45,842.35	55,350.950	8,245.62	7,915.79	16,171.41	21,020.17	6,000.00	2,239.38	8,239.38
Portland.....	428	32,057.12	7,492.37	14,606.977	5,259.08	107,140.59	112,399.67	125,489.58	4,631.59	2,856.03	7,540.62
Roseburg.....	853	73,519.10	12,301.78	28,036.361	12,179.82	161,760.77	173,940.59	173,527.16	6,000.00	3,375.50	10,375.50
The Dalles.....	1,496	239,372.11	112,782.61	140,343.370	21,960.65	19,966.76	41,927.41	42,667.85	6,000.00	4,489.40	7,780.67
Vale.....	683	212,797.84	65,708.37	78,462.010	15,560.42	24,675.75	40,236.17	42,734.97	6,000.00	1,780.67	7,780.67
Indian and private land grants.....											
South Dakota.....				14,514.050							
Bellefourche.....	1,749	274,248.66	141,683.32	129,122.343	19,618.08	26,270.34	45,898.42	45,674.68	6,000.00	4,005.00	10,005.00
Gregory.....	14	482.52	2,199.98	108,172.190	9,683.17	150.00	4,472.74	75,009.56	5,658.18	2,060.00	7,718.18
Lemmon.....	876	35,676.84	100,700.73	175,046.070	6,422.18	3,945.21	12,283.10	107,746.74	6,000.00	4,550.00	10,550.00
Pierre.....	552	27,117.10	70,884.40	85,189.730	4,839.87	3,998.94	8,842.81	9,014.41	4,751.75	1,770.50	6,522.25
Rapid City.....	1,721	204,668.74	149,748.01	110,653.681	17,041.08	20,348.53	37,389.61	37,678.19	5,633.33	3,309.00	11,942.33
Timber Lake.....	7			68,121.230	1,703.36		7,066.27	430,064.04	6,000.00	4,068.81	10,068.81
Indian and private land grants.....				15,275.070							

* Discontinued Aug. 31, 1919. Consolidated with Topeka.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

Location.	Number of appli- cations, entries, etc. (origi- nal and final).	Area.			Receipts for allowed applications and entries.				Indian.	Total earnings.	Expenses.			
		Entered.		Patented.	Fees and commissions.		Purchase money.	Total.			Salaried and com- missions, registers and re- ceivers.	Inc- den- tal.	Total.	
		Original.	Ftnal.		Indian lands.	Public lands.								
Utah:		Area.	Area.	Area.										
Salt Lake City.....	2, 277	387, 874.40	156, 241.69	207, 386.960										
Verona.....	133	15, 285.62	3, 570.11	12, 586.484	\$412.19	1, 704.22	\$337, 239.83	\$371, 471.10	\$20, 006.15	25, 273.08	\$6, 000.00	\$8, 639.68	\$14, 639.68	
Indian and private land grants.....				880.000			3, 354.33	5, 471.24			2, 972.70	1, 121.66	4, 094.36	
Washington:														
Seattle.....	118	13, 367.23	5, 088.89	11, 916.402	2, 402.69	1, 001.34	12, 083.27	13, 084.61		12, 144.08	2, 282.42	3, 125.00	5, 407.42	
Spokane.....	288	26, 741.67	22, 826.24	48, 031.912		3, 458.60	6, 512.14	12, 373.43	13, 633.13	27, 014.52	5, 343.73	3, 213.83	8, 557.56	
Vancouver.....	106	9, 044.45	3, 679.07	19, 451.970		1, 464.54	1, 845.48	3, 310.02		9, 831.38	2, 084.96	1, 750.00	3, 814.96	
Walla Walla.....	271	28, 437.65	20, 549.82	29, 477.520		3, 704.40	3, 471.95	7, 176.35		19, 162.54	3, 345.58	1, 300.00	4, 645.58	
Waterville.....	581	56, 412.24	42, 424.55	61, 168.112	1, 550.09	6, 618.36	7, 631.45	15, 699.90	32, 267.23	49, 169.10	6, 000.00	3, 527.58	9, 527.58	
Yakima.....	230	61, 018.12	17, 369.12	19, 375.887		5, 773.45	2, 286.30	8, 069.75		14, 350.87	5, 869.06	1, 727.50	7, 586.56	
Indian and private land grants.....				6, 759.265										
Wisconsin:														
Wausau.....	162	5, 199.97	3, 838.64	4, 872.810		1, 438.39	1, 377.13	2, 815.52		2, 872.92	2, 112.06	23.65	2, 135.71	
Indian and private land grants.....				32, 009.630										
Wyoming:														
Buffalo.....	3, 340	897, 727.33	145, 791.00	150, 057.160		64, 078.62	42, 040.62	106, 119.24		98, 744.99	6, 000.00	8, 081.18	14, 081.18	
Cheyenne.....	3, 500	604, 320.49	345, 631.00	339, 787.581		62, 337.20	54, 553.98	116, 891.18		122, 838.58	6, 000.00	7, 157.43	13, 157.43	
Douglas.....	4, 968	1, 307, 237.22	186, 674.58	153, 913.283		94, 160.26	49, 249.63	143, 409.89		143, 276.40	6, 000.00	8, 641.83	14, 641.83	
Evansport.....	689	86, 628.90	47, 842.70	50, 092.582		9, 701.36	60, 666.35	70, 367.71		74, 295.03	6, 000.00	1, 637.99	7, 637.99	
Lander.....	1, 200	133, 331.19	42, 423.76	45, 559.510	222.12	11, 832.82	71, 582.91	83, 637.85	1, 633.60	102, 847.03	6, 000.00	3, 267.67	9, 267.67	
Sundance-Newcastle	4, 024	890, 906.91	300, 740.35	265, 564.770		71, 633.46	55, 056.39	126, 689.85		120, 736.34	6, 000.00	7, 621.21	13, 621.21	
Made at General Land Office.....				408.310										
Land offices discontinued				61, 239.640										
Total.....	103, 923	15, 738, 479.17	9, 048, 482.00	11, 850, 401.337	57, 835.07	1, 473, 030.35	2, 242, 249.97	3, 773, 115.39	2, 063, 186.06	5, 998, 575.24	473, 957.61	381, 987.07	855, 944.68	

Office moved to Newcastle Mar. 1, 1920.

States and offices.	Total earnings in detail.								Aggregate.
	Fees and commissions.	Sales of public lands.	Total.	Sales of Government property.	Out-standing liabilities, March 2, 1907.	Sales of reclamation town sites.	Sales of lands and timber in Coos Bay wagon road grant.	Sales of lands in Oregon and California railroad grant.	
Alabama, Montgomery.....	\$4,319.25	\$10,478.48	\$14,797.73						\$14,797.73
Alaska:									
Fairbanks.....	172.89	8,252.75	8,425.64						8,425.64
Juneau.....	1,701.08	25,880.51	27,581.59			\$4,889.55			27,581.59
Nome.....	128.35	9,865.93	9,994.28						9,994.28
Total.....	2,068.02	42,978.92	45,046.94			4,889.55			49,936.49
Arizona, Phoenix.....	61,121.18	82,821.01	143,942.19			42,843.40			187,325.80
Arkansas:									
Camden.....	2,331.20	5,642.13	7,973.33						7,973.33
Clinton.....	5,990.98	5,885.81	11,876.79						11,876.79
Little Rock.....	7,809.85	11,679.33	19,489.68						19,489.68
Total.....	15,631.53	22,717.27	38,348.80						38,348.80
California:									
El Centro.....	5,535.14	13,653.71	19,248.85						23,915.44
Eureka.....	2,538.87	6,826.92	9,365.79						15,545.54
Independence.....	7,324.51	23,897.89	31,222.40						32,127.40
Los Angeles.....	15,901.95	34,774.17	50,676.12		\$701.44	985.00			51,377.56
Sacramento.....	19,504.40	18,099.17	37,603.57						37,603.57
San Francisco.....	15,916.73	16,357.02	32,273.75						46,020.65
Susana.....	5,676.91	9,849.37	15,526.28						16,026.28
Visalia.....	12,230.73	10,107.02	22,337.75						22,337.75
Total.....	85,639.43	193,230.37	278,869.80		701.44	985.00			280,556.24
Colorado:									
Del Norte.....	7,106.75	9,612.02	16,718.77						16,718.77
Denver.....	21,636.94	89,145.06	110,782.00						122,427.00
Durango.....	12,684.31	7,383.38	20,067.69						20,067.69
Glenwood Springs.....	27,859.68	23,233.75	51,093.43						51,093.43
Hugo.....	3,853.69	1,106.41	4,960.10						4,960.10
Leadville.....	42,453.28	17,120.90	59,574.18						59,574.18
Leadville.....	12,241.53	6,925.83	19,167.36						19,167.36
Montrose.....	21,719.33	7,947.47	29,666.80						29,666.80

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

States and offices.	Total earnings in detail.										Aggregate.
	Fees and com- missions.	Sales of public lands.	Total.	Sales of Govern- ment property.	Out- standing liabilities, set Mar. 2 1907.	Sales of reclamation town sites.	Sales of lands in Oregon and Califor- nia railroad grant.	Sales of lands and timber in Coos Bay wagon road grant.	Sales of Indian lands.		
Colorado—Continued.											
Pueblo.....	\$58,300.64	\$23,559.58	\$81,860.22							\$81,860.22	
Sterling.....	17,919.95	11,036.19	28,956.14							28,956.14	
Total.....	225,580.17	147,274.59	372,854.76						\$52,180.99	424,985.45	
Florida, Gainesville.....	5,457.49	12,136.84	17,594.33							17,594.33	
Idaho:											
Blackfoot.....	32,043.49	39,859.79	71,903.27						2,980.00	74,883.27	
Boise.....	18,664.60	50,722.97	69,388.57							69,388.57	
Coeur d'Alene.....	2,399.16	7,422.13	9,732.29		\$80.94				5,928.98	15,737.21	
Hailey.....	24,978.81	19,215.12	44,193.93			\$12,940.16				57,334.09	
Lewiston.....	4,488.91	4,106.51	8,595.42		22.80					8,617.72	
Total.....	82,484.97	121,328.51	203,813.48		103.24	12,940.16			8,908.98	226,160.86	
Kansas, Topeka.....	4,960.19	2,628.06	7,578.25							8,609.65	
Louisiana, Baton Rouge.....	5,147.33	9,618.85	14,766.18						1,031.40	15,797.58	
Michigan, Marquette.....	1,786.10	4,909.96	6,706.06							6,706.06	
Minnesota:											
Cass Lake.....	13,017.73	1,303.50	14,321.23						140,809.50	154,630.73	
Crookston.....	10,200.58	12,433.95	22,634.53						113,147.86	135,781.39	
Duluth.....	2,064.65	2,431.75	4,496.40		31.40				3,137.98	7,638.76	
Total.....	25,291.96	17,169.20	42,461.16		31.40				256,615.32	299,107.88	
Mississippi, Jackson.....	3,328.45	13,269.21	16,597.66							16,597.66	
Missouri, Springfield.....	364.20	1,665.06	2,029.26							2,029.26	
Montana:											
Billings.....	14,771.62	1,070.18	15,841.80			4,382.85			113,507.63	133,732.28	
Bozeman.....	14,844.31	9,241.49	24,085.80							24,085.80	
Glasgow.....	33,262.93	27,628.69	60,891.62		208.00	10,727.04			281,511.85	373,694.49	
Great Falls.....	15,403.47	26,738.76	42,142.23			250.00			41,442.23	42,692.47	
Harve.....	42,688.09	71,069.99	113,758.08			126.30				113,871.28	

Idaho.....	34,739.78	80,513.08	85,242.86							45,103.10	85,242.86
Kalispell.....	3,511.58	966.45	4,478.03								4,478.03
Lewistown.....	36,238.69	42,797.35	79,036.04								79,036.04
Miles City.....	37,033.29	52,627.74	138,631.03								138,631.03
Minersville.....	5,106.89	8,364.44	13,464.33								13,464.33
Total.....	307,571.65	280,896.17	597,967.82								597,967.82
Nebraska.....											
Alliance.....	4,650.73	25,028.17	29,678.90								29,678.90
Broken Bow.....	2,866.14	14,865.29	17,744.43								17,744.43
Lincoln.....	1,064.99	3,265.30	4,330.19								4,330.19
Total.....	8,581.96	43,208.66	51,803.52								51,803.52
Nevada.....											
Carson City.....	7,910.46	21,524.15	29,434.61								29,434.61
Elko.....	6,675.36	9,624.43	16,299.79								16,299.79
Total.....	14,585.82	31,148.58	45,734.40								45,734.40
New Mexico.....											
Claret Summer.....	15,179.20	11,307.22	26,486.42								26,486.42
Fort Sumner.....	18,034.96	2,585.81	20,620.77								20,620.77
Las Cruces.....	19,732.38	27,265.99	47,008.37								47,008.37
Reynolds.....	45,638.53	7,038.53	52,677.06								52,677.06
Santa Fe.....	38,905.52	5,914.34	44,819.86								44,819.86
Tucumanari.....	9,911.92	1,443.20	11,355.12								11,355.12
Total.....	147,652.51	50,602.39	198,254.90								198,254.90
North Dakota.....											
Bismarck.....	2,777.09	2,125.09	4,902.18								4,902.18
Dickinson.....	9,861.57	2,349.56	12,211.13								12,211.13
Minot.....	3,187.06	6,373.34	9,560.40								9,560.40
Williston.....	4,307.62	1,659.78	5,967.40								5,967.40
Total.....	20,133.34	11,907.77	32,041.11								32,041.11
Oklahoma, Guthrie.....											
Total.....	3,886.90	10,555.34	14,472.24								14,472.24
Oregon.....											
Burns.....	13,137.24	14,481.04	27,618.28								27,618.28
La Grande.....	9,616.48	27,147.32	46,763.80								46,763.80
Lakeview.....	8,284.43	12,735.74	21,020.17								21,020.17
Portland.....	5,618.40	9,919.53	6,537.93								6,537.93
Roseburg.....	12,116.53	5,401.07	17,517.60								17,517.60
The Dalles.....	20,306.76	20,306.76	42,667.85								42,667.85
Vale.....	15,691.17	27,043.80	42,734.97								42,734.97
Total.....	96,825.34	106,035.26	204,860.60								204,860.60

COMMISSIONER OF THE GENERAL LAND OFFICE.

[illegible]

Sundries.....	48,122.53	37,234.20	85,358.73						85,358.73
Newcastle.....	27,360.81	37,234.20	35,594.11	772.50					35,594.11
Total.....	835,163.67	296,454.64	631,618.31	73.50	29,413.26			1,683.00	662,738.67
Aggregate, all States.....	1,587,060.70	1,959,101.89	3,546,162.66	182.75	1,327.08	124,147.26	\$182,778.11	\$80,811.30	5,998,576.24
General Land Office:									
Sales of public lands.....		38,200.00							38,200.00
Depredations, public.....									40,406.70
Power permits.....									8,401.55
Coal lease.....									7,890.89
Copies of records.....									26,700.86
Sale of fire-killed timber, public lands.....									282.95
Sale of fire-killed timber, Ute Indian lands.....									146.71
Sales of timber, O. and C. grant.....							1,386.99		1,386.99
Sale of timber, Alaska.....									66.25
Sale of Government general officers' general.....									1,328.70
Sales of Government property.....									8,480.98
Copies of records.....									
Aggregate.....	1,587,060.70	1,990,764.16	3,577,824.95	1,489.45	1,327.08	124,147.26	184,168.10	80,811.30	6,131,776.41

Office moved to Newcastle Mar. 1, 1920.

NOTE.—"Total earnings" are receipts credited to United States.

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

RECAPITULATION BY STATES.

Location.	Number of applications, entries, etc. (original and final).	Area.			Receipts for allowed applications and entries.				Indian.	Total earnings.	Expenses.		
		Entered.		Patented.	Fees and commissions.		Purchase money.	Total.			Salaries and commissions registers and receivers.	Ind- dental.	Total.
		Original.	Final.		Indian lands.	Public lands.							
Alabama.....	498	Acres.	Acres.	Acres.			\$4,204.26	\$10,328.88	\$14,533.13	\$14,797.73	\$3,803.83	\$1,907.20	\$5,711.03
Alaska.....	343	20,092.76	13,738.24	20,405.27			12,963.76	10,845.11	13,049.44	49,906.59	4,010.60	6,150.37	10,160.90
Arizona.....	4,317	1,831,739.30	180,267.38	255,942.728			15,019.64	87,688.43	143,699.90	187,329.80	11,068.37	1,108.37	21,036.27
Arkansas.....	2,301	1,831,739.30	104,136.67	119,556.215			15,379.51	28,919.88	43,299.49	38,348.80	11,661.17	9,375.10	24,036.27
California.....	5,901	913,580.80	349,655.63	515,394.198	\$33.86		84,261.51	109,393.88	192,688.93	243,270.39	43,718.31	30,562.52	74,280.83
Colorado.....	14,624	1,759,486.63	1,698,954.89	1,991,019.17	12,836.16		211,213.51	151,852.35	375,632.02	424,965.45	57,035.84	42,477.39	99,513.23
Florida.....	6,376	28,671.83	25,905.20	36,230.267			78,960.50	110,195.72	189,356.37	17,594.33	4,507.51	4,967.28	9,474.76
Idaho.....	6,376	924,110.33	527,300.72	680,864.052	180.33		78,960.50	110,195.72	189,356.37	226,160.86	24,665.85	23,996.00	48,691.85
Kansas.....	330	15,459.36	100,733.26	108,327.12			4,286.19	2,728.06	8,568.37	8,909.65	5,371.40	2,834.41	8,305.81
Louisiana.....	170	6,562.27	5,542.24	8,781.98			1,640.49	9,618.55	13,917.04	14,769.18	5,319.62	2,279.37	10,598.99
Michigan.....	578	21,839.24	27,234.86	266,384.20			4,834.96	17,093.99	42,326.02	298,107.88	14,242.62	8,868.10	23,110.72
Minnesota.....	338	11,365.11	9,731.15	21,535.19			3,270.62	13,009.12	16,279.74	16,497.66	3,596.64	2,732.02	6,327.66
Mississippi.....	47	1,000.00	2,010.05	4,073.60			3,357.35	1,665.06	2,022.41	2,029.26	8,862.51	613.00	1,475.51
Montana.....	19,594	2,197,088.41	2,381,718.95	3,401,399.914			296,443.12	265,219.41	593,793.98	471,975.091	1,063,833.60	64,841.40	122,611.37
Nebraska.....	1,028	51,141.44	149,321.83	195,131.03			8,382.12	42,965.33	51,847.45	51,803.52	9,348.13	16,901.80	16,901.80
Nevada.....	1,019	182,292.00	43,583.66	102,489.855			12,830.25	27,269.44	40,099.69	45,734.40	11,792.05	4,201.40	15,993.45
New Jersey.....	1	1,460,164.37	962,467.37	1,051,943.666			137,338.30	38,100.00	38,100.00	186,305.24	39,000.00	39,597.54	75,597.54
New Mexico.....	9,721	95,268.17	203,960.43	270,913.438			17,634.74	49,470.39	186,308.09	187,662.40	19,356.77	7,118.34	26,475.11
North Dakota.....	516	15,561.39	43,548.96	80,510.724			3,094.32	110,169.90	31,419.43	137,267.81	5,909.16	2,893.68	8,802.84
Oklahoma.....	6,493	1,024,285.89	387,009.90	484,854.558			95,746.07	362,886.24	458,582.31	490,101.20	40,661.59	21,215.48	61,897.07
Oregon.....	4,919	542,193.86	465,216.44	664,578.669			50,492.74	54,713.02	115,942.95	706,188.23	34,043.26	22,753.31	56,796.57
South Dakota.....	2,410	403,159.92	159,811.70	220,863.444			35,935.49	376,942.95	20,009.15	640,072.23	8,972.70	9,761.34	18,734.04
Utah.....	1,594	195,021.36	111,937.69	196,181.068			22,020.69	340,594.66	59,714.06	124,772.92	24,906.79	14,643.91	39,549.66
Washington.....	1,162	5,199.97	3,838.64	36,882.44			1,438.39	1,377.13	2,815.82	2,672.92	23.65	2,135.71	2,135.71
Wisconsin.....	17,721	3,920,152.04	1,069,103.39	1,004,974.886			313,743.72	833,149.88	647,116.72	662,738.67	36,000.00	36,897.81	72,897.81
Made at General Land Office.....				408.31									
Offices discontinued.....				61,239.64									
Total.....	103,923,153	738,479,179	9,048,482.00	11,880,401.337	57,835.071	1,473,080.262	2,242,249.973	773,115.392	3,083,186.065	5,998,575.24	2,473,957.61	381,987.07	885,944.68

RECAPITULATION BY CLASSES OF ENTRIES.

State or Territory.	At public auction.			Subject to presumption entry.			Timber and stone.			Mineral.			Coal.		
	En-tries.	Acres.	Amount.	En-tries.	Acres.	Amount.	En-tries.	Acres.	Amount.	En-tries.	Acres.	Amount.	En-tries.	Acres.	Amount.
Alabama.....															
Alaska.....															
Arizona.....	14	1,265.78	\$3,453.89				39	2,113.88	\$8,894.28	32	1,694.13	\$4,745.00	1	315.96	\$3,159.60
Arkansas.....	16	1,623.66	1,530.45							83	7,069.79	\$5,202.50			
California.....	147	8,880.66	22,752.35				48	3,970.18	14,503.91	5	400.00	1,000.00			
Colorado.....	236	17,068.11	46,078.23				70	6,201.36	18,019.94	70	5,237.59	19,640.00			
Florida.....	236	17,447.59	1,305.79	5	718.93	\$898.75	35	4,227.85	13,227.95	51	5,192.84	17,457.50	6	284.10	17,211.25
Idaho.....	8	4,183.45	16,707.10				9	642.66	2,800.47						
Iowa.....	60	4,367.11	1,375.53				21	2,440.00	9,679.00	33	4,724.18	15,107.00	1	160.00	1,600.00
Kansas.....	7	367.11	2,827.19												
Louisiana.....	5	185.64					24	1,484.53	4,553.25						
Michigan.....							22	1,398.41	4,597.45						
Minnesota.....	3	42.15	200.00				13	655.54	1,764.00						
Mississippi.....							30	2,104.72	11,639.53						
Montana.....	48	661.54	143,118.23				36	3,858.31	13,751.91	67	1,607.73	7,881.50	13	955.48	19,192.00
Nebraska.....	142	8,790.57	39,183.54	5	215.99	696.89				14	3,194.13	4,425.00	4	500.90	5,640.00
Nevada.....	20	1,320.66	3,172.75							12	1,522.60	6,845.00	1	71.84	3,355.90
New Mexico.....	135	9,559.34	22,625.38										8	400.00	8,000.00
North Dakota.....	15	532.79	2,132.39				70	8,142.30	26,983.54	9	872.81	3,755.00	1	160.00	3,200.00
Oregon.....	223	18,293.72	51,432.24				12	1,152.87	3,124.42						
South Dakota.....	97	6,063.05	20,275.03							38	1,539.55	7,127.50	24	2,412.82	303,301.15
Utah.....	53	3,828.82	14,665.25				22	2,352.96	8,112.88	10	714.22	3,582.60			
Washington.....	49	2,796.31	8,766.75				7	285.03	776.60						
Wisconsin.....							225	29,013.10	74,783.09	17	1,820.49	6,750.71	13	1,397.20	80,568.00
Wyoming.....	438	38,334.35	111,676.42												
Total.....	2,339	170,703.35	513,294.51	10	824.92	1,494.64	683	70,033.96	217,729.24	440	35,581.86	133,279.31	73	6,697.80	445,225.90

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

Disposition of abandoned military reservations.														Excess area payments.		
States.	Sales.				Original.				Final.				Commuted.		Acrea.	Amount.
	Num-ber.	Acres.	Amount.	Num-ber.	Acres.	Fees and commis-sions.	Purchase money.	Num-ber.	Acres.	Fees and commis-sions.	Purchase money.	Num-ber.	Acres.	Amount.		
Alabama.....																
Alaska.....																
Arizona.....																
Arkansas.....																
California.....																
Colorado.....																
Florida.....	6	269.34	\$509.30													
Idaho.....	101	3,689.13	18,191.40													
Kansas.....																
Louisiana.....																
Michigan.....																
Minnesota.....																
Mississippi.....																
Montana.....																
Nebraska.....																
Nevada.....																
New Jersey.....	1	26.09	38,100.00													
New Mexico.....																
North Dakota.....																
Oregon.....	11	354.06	1,893.34													
South Dakota.....																
Utah.....																
Washington.....	42	772.69	5,458.47													
Wyoming.....																
Total.....	160	5,110.30	64,152.51	36	6,689.82	606.80	2,343.43	94	13,880.98	513.35	12,093.67	9	1,319.80	2,370.00	3,463	24,380.46

Desert land entries.															
State.	Number.		Acres.		Amount.		Desert land relief, act of Mar. 4, 1916.								Proof in the manner required of a homestead entryman.
							Elections to purchase.				Final.					Commuted.
	Orig-inal.	Final.	Original.	Final.	Num-ber.	Acres.	Amount.	Num-ber.	Acres.	Amount.	Num-ber.	Acres.	Amount.	Num-ber.		Acres.
Arizona.....	215	38	38,456.15	6,371.15	89,628.46	86,375.16	55	10,677.84	\$5,343.15	47	8,512.31	86,983.07	13	2,490.46	
California.....	237	58	26,265.30	7,538.27	9,066.98	7,660.60	190	24,195.68	17,117.73	88	19,512.71	14,630.31	8	2,122.32	
Colorado.....	41	98	5,288.79	14,634.75	1,322.58	14,676.06	136	25,772.32	12,949.62	163	35,264.23	26,479.26	16	3,311.55	
Idaho.....	119	111	17,965.07	14,246.96	4,492.01	14,246.97	96	16,140.31	8,073.87	9	1,384.60	1,384.60	5	1,600.06	
Montana.....	66	101	10,060.17	19,457.89	2,485.49	19,468.26	145	20,183.90	13,096.23	173	29,685.85	22,245.23	13	3,839.70	
Nevada.....	90	38	16,245.60	7,054.11	4,144.11	7,054.12	6	1,013.64	13,606.32	4	26,743.05	26,743.05	13	3,839.70	
New Mexico.....	14	1	1,233.89	1,081.41	308.35	1,080.00	21	3,307.12	1,663.66	28	4,997.92	3,742.21	3	960.00	
North Dakota.....	1	1	1,233.89	1,081.41	308.35	1,080.00	21	3,307.12	1,663.66	28	4,997.92	3,742.21	3	960.00	
Oregon.....	26	30	3,564.88	3,227.70	891.19	3,230.39	47	7,405.10	3,702.48	30	5,753.90	4,319.58	8	1,880.46	
South Dakota.....	2	2	2,640.00	2,640.00	90.00	2,640.00	8	1,118.06	559.75	89	13,569.84	10,175.70	9	1,407.43	
Utah.....	113	79	21,833.19	8,596.94	5,473.05	8,596.83	8	1,043.23	821.91	2	4,570.01	3,425.73	9	1,407.43	
Washington.....	11	7	904.69	771.73	226.78	771.73	187	37,267.24	18,660.05	27	4,570.01	3,425.73	6	676.17	
Wyoming.....	52	86	14,633.23	14,716.94	3,661.50	14,758.03	36	5,589.72	2,819.93	56	9,833.00	7,032.69	1	160.00	
Total.....	1,026	649	166,960.76	98,077.54	41,770.50	98,176.15	904	169,724.74	84,993.09	713	133,940.90	99,497.97	85	18,478.15	

Entries made and expenses incurred at district land offices during fiscal year ended June 30, 1920—Continued.

State.	Entries.				Homestead entries.				Amount.				State selections.				Railroad selections.			
	Final.		Com-mut-ed.	Acres.	Original.	Final.	Com-mut-ed.	Original.	Final.	Com-mut-ed.	Acres.	Amount.	Num-ber.	Acres.	Amount.	Num-ber.	Area.	Amount.	Num-ber.	Amount.
	Orig-inal.	Final.																		
Alabama.....	272	125	14		20,712.78	9,585.54	1,069.15	\$2,244.45	\$238.30	\$1,323.60	1	280.98	\$4.00							
Alaska.....	94	67			1,807.18	12,728.81		1,352.20	558.33											
Arizona.....	1,637	934	42		374,463.90	147,317.83	5,747.32	31,444.26	6,194.07	7,566.17	642	349,876.90	2,271.00			5	1,044,588.19	\$13,062.00		
Arkansas.....	1,056	1,004	80		91,399.53	89,907.37	8,085.93	9,615.77	2,265.33	9,900.92										
California.....	2,849	1,847	65		721,691.13	290,872.59	8,983.34	60,315.77	14,128.04	13,236.13	55	7,023.53	154.00			12	147,730.74	1,936.00		
Colorado.....	6,173	6,689	75		1,744,150.15	1,609,431.84	8,221.09	127,368.58	64,488.94	7,173.02	17	7,007.69	96.00			1	40.00	2.00		
Florida.....	306	192	62		78,744.91	18,741.78	5,743.15	2,901.02	470.68	7,173.02	5	7,226.87	10.00							
Idaho.....	2,680	2,619	54		763,690.74	432,507.80	7,254.15	52,975.96	17,510.26	9,203.20	235	136,862.27	1,770.00			8	5,775.60	80.00		
Iowa.....	80	484	8		15,469.36	99,511.85	854.30	1,208.94	3,570.92	1,276.28										
Kansas.....	173	66	18		10,919.83	4,182.09	940.95	1,300.46	140.86	1,276.28	1	20.20	2.00							
Louisiana.....	77	42	9		6,562.27	3,487.50	573.17	1,690.40	138.45	716.37										
Michigan.....	232	284	23		20,747.80	25,338.70	1,197.83	2,177.77	761.46	1,702.20						10	1,071.61	28.00		
Minnesota.....	162	96	12		11,365.11	6,588.45	1,034.35	1,268.51	186.97	1,273.04										
Mississippi.....	6	10			400.00	678.28		45.00	22.25											
Missouri.....	7,802	9,563	72		2,065,510.40	2,252,394.44	8,032.78	167,379.05	104,436.85	10,705.35	13	3,260.77	48.00			53	81,104.82	1,065.00		
Montana.....	24	529	24		51,141.44	137,368.19	2,596.59	4,010.75	2,094.62	3,240.89										
Nebraska.....	444	224	6		114,335.71	32,032.07	840.00	8,598.17	1,900.63	1,250.00						4	51,350.30	644.00		
Nevada.....	4,530	4,089	30		1,398,155.47	922,166.72	3,708.15	93,682.26	35,115.22	4,659.47	152	57,255.07	390.00			4	400.00	8.00		
New Mexico.....	1,287	1,287	15		95,274.67	201,732.43	1,125.21	7,610.26	7,024.51	1,759.33	1	13.50	2.00							
North Dakota.....	533	1,178	77		15,561.38	21,853.01	2,477.26	1,552.28	514.60	9,332.51						21	1,261.75	60.00		
Oregon.....	3,884	1,753	23		999,607.53	345,503.41	7,818.65	76,017.95	13,271.83	3,818.57										
South Dakota.....	1,852	2,516	6		524,474.90	439,376.62	3,256.53	29,906.63	11,671.83	2,483.22	31	17,358.96	224.00							
Utah.....	1,180	622	6		347,559.40	142,608.61	680.00	26,526.57	6,004.26	850.00	53	30,587.62	402.00			19	50,210.03	650.00		
Washington.....	692	641	14		143,906.64	97,733.39	1,580.23	13,640.31	5,158.77	2,665.80						2	944.00	12.00		
Wisconsin.....	4	79	10		4,217.91	3,113.19	440.42	581.75	114.58	900.53										
Wyoming.....	11,327	3,857	32		3,899,451.32	966,048.21	4,309.82	265,384.22	28,410.39	5,436.19	55	6,067.49	120.00							
Commissions on Indian lands.....								38,725.50	17,025.53											
Total.....	48,532	39,774	897		13,511,100.50	8,372,686.79	86,546.53	1,028,513.02	363,346.68	112,821.21	1,261	615,341.95	5,503.00			140	1,384,977.04	17,556.00		

State.	Applications.						Mineral adverse claims.				Filings.						Fees.		Miscellaneous entries, applications, sales, etc.			
	Coal lands.		Timber and stone lands.		Mineral lands.		Preemption.		Homesteads.		Coal land.		Reservoir.		Car-calla-tions.	Received for reduc-ing testi-mony to writing, etc.						
	Num-ber.	Fees.	Num-ber.	Fees.	Num-ber.	Fees.	Num-ber.	Fees.	Num-ber.	Fees.	Num-ber.	Fees.	Num-ber.	Fees.			Num-ber.	Acres.	Amount.			
Alabama.			38	\$380														81,236.60	3	1,046.77	\$100.00	\$100.00
Alaska.					14	\$140												136.80	133	2,849.98	2,956.68	2,956.68
Arizona.					76	760												1,866.28	517	26,040.61	18,615.33	18,615.33
Arkansas.			31	310	2	20				6	\$18		4	\$12				3,161.21	3	1,139.51	1,474.39	1,474.39
California.			56	560	60	600				1	3		2	\$6				6,437.36	33	1,186.76	1,968.26	1,968.26
Colorado.	9	\$90	23	230	51	510				10	\$492		12	36				17,256.98	2	480.00	750.00	750.00
Florida.			9	90														1,972.99	3	60.52	101.68	101.68
Idaho.			17	170	28	280				4	12		4	12				6,010.93	57	806.97	17,732.36	17,732.36
Kansas.																		1,046.45	5	3,096.47	811.43	811.43
Louisiana.			24	240														2,609.87	2	94.16	99.76	99.76
Michigan.			17	170														774.61	3	120.47	13,429.66	13,429.66
Minnesota.			8	80														1,792.47	3	3.68	4.64	4.64
Mississippi.			28	280														1,620.14	30	1,331.77	1,665.06	1,665.06
Missouri.																		283.10	83	3,331.77	5,450.87	5,450.87
Montana.	20	200	24	240	60	600				4	12		15	45		50	150	20,918.42	289	2	233.86	537.60
Nebraska.																		1,122.45	5	11,413.76	4,513.86	4,513.86
Nevada.	6	60			30	300				2	20					62	186	2,869.97	366	11,413.76	587.60	587.60
New Mexico.	5	50			14	140				1	10		8	24		31	83	7,711.96	91	14,238.62	262,539.86	262,539.86
North Dakota.	9	90											1	2		2	2	34,891.59	50	18,729.10	17,463.86	17,463.86
Oklahoma.																		26	907.97	3,079.71	3,079.71	3,079.71
Oregon.			62	620	8	80				2	6		2	6		54	164	4,891.89	164	3,381.26	586.26	586.26
South Dakota.	2	20	6	60	3	30				11	23		13	39		44	132	2,192.61	3	3,079.71	2,000.00	2,000.00
Utah.	50	500	21	210	21	210				7	70		3	9		4	12	2,192.61	3	3,079.71	586.26	586.26
Washington.	2	20	5	50	8	80				1	2		1	2		60	180	7,509.11	280	3,780.23	22,680.00	22,680.00
Wisconsin.																		138.06	3	3,780.23	2,084.04	2,084.04
Wyoming.																		107,469.91	1,844	87,720.49	476,452.22	476,452.22
Commissioners on Indian lands.	24	240	93	930	25	250				186	555		60	180		2	6	7,509.11	280	3,780.23	2,084.04	2,084.04
Total.	126	1,260	462	4,620	400	4,000				12	120		168	504		264	777	107,469.91	1,844	87,720.49	476,452.22	476,452.22

VACANT PUBLIC LANDS ON JULY 1, 1920.

Statement showing the area of land unappropriated and unreserved on July 1, 1920.

[Counties containing no unappropriated lands are omitted.]

ALABAMA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Montgomery:				
Autauga.....	40	.....	40	Sandy, pine.
Baldwin.....	3,400	.....	3,400	Rolling, pine, sandy.
Barbour.....	120	.....	120	Broken, hilly, rolling.
Calhoun.....	540	.....	540	Do. ¹
Cherokee.....	2,140	.....	2,140	Pine, broken, rolling.
Chilton.....	160	.....	160	Do.
Choctaw.....	800	.....	800	Do.
Clarke.....	240	.....	240	Hilly, broken, pine.
Clay.....	1,200	.....	1,200	Do.
Cleburne.....	2,800	.....	2,800	Do.
Colbert.....	240	.....	240	Level, pine, sandy.
Conecuh.....	120	.....	120	Pine lands, rolling.
Coosa.....	400	.....	400	Level pine lands.
Covington.....	840	.....	840	Broken, rolling, pine.
Crenshaw.....	40	.....	40	Do.
Dale.....	160	.....	160	Do.
Dekalb.....	820	.....	820	Level, pine lands, rolling.
Escambia.....	120	.....	120	Broken, rocky, hilly.
Etowah.....	40	.....	40	Do.
Fayette.....	1,640	.....	1,640	Broken, hilly, pine.
Franklin.....	560	.....	560	Do.
Geneva.....	40	.....	40	Level, pine, sandy.
Green.....	80	.....	80	Broken, pine.
Houston.....	240	.....	240	Level, pine, sandy.
Jackson.....	3,640	.....	3,640	Broken, rolling, pine.
Lamar.....	520	.....	520	Do.
Lauderdale.....	400	.....	400	Level, pine, broken.
Madison.....	4,920	.....	4,920	Broken, mountainous, pine.
Marion.....	2,640	.....	2,640	Hilly, broken, pine.
Marshall.....	500	.....	500	Level, pine lands.
Mobile.....	400	.....	400	Level, pine, broken.
Monroe.....	160	.....	160	Broken, hilly, rolling.
Morgan.....	480	.....	480	Do.
Perry.....	40	.....	40	Level, pine.
Pickens.....	520	.....	520	Broken, hilly, rolling, pine.
Pike.....	360	.....	360	Level, pine.
St. Clair.....	360	.....	360	Broken, hilly, rolling, pine.
Shelby.....	480	.....	480	Broken, rolling, pine.
Sumter.....	80	.....	80	Level, broken, pine.
Talladega.....	1,440	.....	1,440	Broken, hilly, pine.
Tuscaloosa.....	2,600	.....	2,600	Do.
Walker.....	40	.....	40	Broken, rolling, pine.
Washington.....	840	.....	840	Do.
State total.....	37,200	.....	37,200	

ARIZONA.

Phoenix:				
Apache.....	450,250	.....	450,250	Mountainous and arid.
Cochise.....	340,000	60,000	400,000	Do.
Cocconino.....	300,000	8,000	308,000	Do.
Gila.....	30,000	90,000	120,000	Broken, grazing land.
Graham.....	363,330	225,000	588,330	Do.
Greenlee.....	98,336	200,000	298,336	Arid and grazing.
Maricopa.....	978,450	1,500,000	2,478,450	Arid desert land.
Mohave.....	1,355,446	1,840,000	3,195,446	Mountainous, grazing.
Navajo.....	300,000	50,000	350,000	Rough, grazing.
Pima.....	465,237	2,600,000	3,065,237	Arid desert land.
Pinal.....	485,000	887,400	1,372,400	Arid and grazing.
Santa Cruz.....	42,460	20,000	62,460	Rough, grazing land.
Yavapai.....	655,000	645,000	1,300,000	Do.
Yuma.....	780,000	3,500,000	4,280,000	Arid and grazing.
State total.....	6,643,509	11,625,400	18,268,909	

¹ "Do." is an abbreviation of the word "ditto" which means "the same."

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

ARKANSAS.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Camden:				
Ashley.....	135		135	River or creek land.
Bradley.....	167		167	Swampy.
Calhoun.....	24		24	River land, small tracts.
Clark.....	40		40	Broken.
Cleveland.....	14		14	River land, small tracts.
Columbia.....	8		8	Low, wet land.
Drew.....	2		2	On river.
Garland.....	2,956		2,956	Mountainous.
Hempstead.....	35		35	On river, small tracts.
Hot Spring.....	923		923	Mountainous.
Howard.....	1,797		1,797	Do.
La Fayette.....	84		84	Low, wet land.
Little River.....	102		102	River land.
Miller.....	56		56	Part hilly, part in bottom.
Montgomery.....	11,866		11,866	Mountainous.
Ouachita.....	5		5	In river bottom.
Pike.....	3,498		3,498	Mountainous.
Polk.....	10,412		10,412	Do.
Saline.....	84		84	Do.
Scott.....	202		202	Do.
Sevier.....	507		507	Do.
Union.....	13		13	River or creek land.
Total.....	32,930		32,930	
Harrison:				
Baxter.....	16,380		16,380	Mountainous, timbered, mineral.
Benton.....	680		680	Mountainous, timbered.
Boone.....	2,320		2,320	Mountainous, timbered, mineral.
Carroll.....	1,760		1,760	Mountainous, timbered.
Crawford.....	360		360	Do.
Franklin.....	1,240		1,240	Do.
Fulton.....	10,000		10,000	Do.
Independence.....	200		200	Do.
Isard.....	9,280		9,280	Do.
Johnson.....	400		400	Do.
Madison.....	5,760		5,760	Do.
Marion.....	8,280		8,280	Mountainous, timbered, mineral.
Newton.....	10,580		10,580	Do.
Searcy.....	8,320		8,320	Mountainous, timbered.
Stone.....	21,180		21,180	Do.
Van Buren.....	680		680	Do.
Washington.....	6,600		6,600	Do.
Total.....	104,020		104,020	
Little Rock:				
Arkansas.....	210		210	Level.
Cleburne.....	13,160		13,160	Mountainous, timbered.
Cleveland.....	35		35	Broken, timbered.
Conway.....	1,557		1,557	Mountainous, timbered.
Crawford.....	6,040		6,040	Do.
Cross.....	163		163	Swampy, timbered.
Desha.....	40		40	Do.
Faulkner.....	1,040		1,040	Broken, timbered.
Franklin.....	4,470		4,470	Broken, mountainous, timbered.
Fulton.....	4,560		4,560	Broken, timbered.
Garland.....	935		935	Broken, mountainous, timbered.
Grant.....	80		80	Broken, timbered.
Independence.....	5,410		5,410	Do.
Isard.....	3,760		3,760	Do.
Jackson.....	200		200	Do.
Johnson.....	9,240		9,240	Broken, mountainous, timbered.
Lawrence.....	500		500	Broken, timbered.
Logan.....	5,300		5,300	Do.
Lonoke.....	40		40	Rolling.
Mississippi.....	47		47	Swampy, timbered.
Montgomery.....	100		100	Do.
Perry.....	1,090		1,090	Do.
Poinsett.....	82		82	Do.
Pope.....	5,980		5,980	Broken, timbered.
Pulaski.....	61		61	Do.
Randolph.....	4,960		4,960	Do.
Saline.....	780		780	Broken, mountainous, timbered.
Scott.....	17,840		17,840	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

ARKANSAS—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Little Rock—Continued.				
Sebastian.....	2,382		2,382	Broken, mountainous, timbered.
Sharp.....	9,924		9,924	Do.
Van Buren.....	35,120		35,120	Broken, timbered.
White.....	599		599	Do.
Woodruff.....	60		60	Swampy.
Yell.....	3,880		3,880	Broken, timbered.
Total.....	139,645		139,645	
State total.....	276,595		276,595	

CALIFORNIA.

El Centro:				Level, rolling, mountainous, all desert.
Imperial.....	1,059,504	354,770	1,414,274	Do.
Riverside.....	900,386	778,580	1,678,965	Do.
San Diego.....	317,835	83,715	401,550	Do.
Total.....	2,277,734	1,217,045	3,494,779	
Eureka:				Sea beach and forest listings.
Del Norte.....	740		740	Mountainous, timber, and grazing.
Humboldt.....	46,320	16,851	63,171	Mountainous and grazing.
Mendocino.....	4,040		4,040	Forest listings, farming, grazing, and mineral.
Slaskiyou.....	3,490		3,490	Mineral, grazing, and farming.
Trinity.....	18,620		18,620	
Total.....	73,210	16,851	90,061	
Independence:				Mountainous, grazing, and mineral.
Alpine.....	10,581		10,581	Mountainous, desert, grazing, and agricultural.
Inyo.....	2,693,982	1,156,268	3,850,240	Grazing, mineral, and agricultural.
Kern.....	561,109	124,760	685,869	Mountainous, grazing, and agricultural.
Mono.....	258,316	42,124	300,440	Mountainous, mineral, and desert.
San Bernardino.....	2,083,884	1,213,515	3,297,399	Mountainous and grazing.
Tulare.....	52,675		52,675	
Total.....	5,660,547	2,536,657	8,197,204	
Los Angeles:				Arid, level desert, mountainous.
Kern.....	20,772	5,393	26,165	Do.
Los Angeles.....	476,750	5,916	482,666	Mountainous, hilly.
Orange.....	19,726	1,624	21,350	Mountainous, rolling, and level desert.
Riverside.....	211,196	20,011	231,207	Do.
San Bernardino.....	3,302,762	308,676	3,611,438	Do.
San Diego.....	88,505	2,240	90,745	Mountainous.
Santa Barbara.....	1,180		1,180	Do.
Ventura.....	34,293	9,410	43,703	
Total.....	4,155,184	353,270	4,508,454	
Sacramento:				Mountainous.
Alpine.....	12,435	300	12,735	Hilly, grazing, mineral.
Amador.....	12,223		12,223	Do.
Butte.....	17,764	320	18,084	Do.
Calaveras.....	39,253		39,253	Hilly, grazing.
Colusa.....	22,328	1,980	24,308	Hilly, grazing, mineral.
El Dorado.....	29,401		29,401	Hilly, grazing.
Fresno.....	4,470	1,380	5,850	Do.
Glenn.....	10,982		10,982	Do.
Lake.....	11,027		11,027	Hilly, grazing, mineral.
Madera.....	1,451	600	2,051	Do.
Mariposa.....	38,486		38,486	Hilly, grazing.
Merced.....	982		982	Do.
Modoc.....	793	4,342	5,135	Do.
Napa.....	17,507		17,507	Hilly, grazing, mineral.
Nevada.....	38,845		38,845	Do.
Placer.....	8,391		8,391	Do.
Sacramento.....	39		39	Do.
Shasta.....	162,780	1,820	164,600	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

CALIFORNIA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Sacramento—Continued.				
Siskiyou.....	72,937	32,067	105,004	Mountainous.
Stanislaus.....	1,529		1,529	Hilly, grazing, mineral.
Sutter.....	200		200	Do.
Tehama.....	42,389	2,000	44,389	Do.
Trinity.....	27,061	4,700	31,761	Do.
Tuolumne.....	15,863	1,600	17,463	Do.
Yolo.....	21,232		21,232	Hilly, grazing.
Yuba.....	4,610		4,610	Hilly, grazing, mineral.
Total.....	614,978	51,100	666,067	
San Francisco:				
Alameda.....	614	1,280	1,894	Mountainous.
Colusa.....	11,175		11,175	Do.
Contra Costa.....	1,368		1,368	Do.
Fresno.....	32,166	3,862	36,028	Do.
Glenn.....	2,400		2,400	Do.
Kern.....	16,578	640	17,218	Do.
Kings.....	768		768	Do.
Lake.....	131,655	8,060	139,715	Do.
Mendocino.....	166,008	3,158	169,166	Do.
Merced.....	4,565		4,565	Do.
Monterey.....	156,643	2,660	159,303	Do.
Napa.....	37,110		37,110	Do.
San Benito.....	143,907	8,960	152,867	Do.
San Joaquin.....	320		320	Do.
San Luis Obispo.....	143,590	2,473	146,063	Do.
Santa Barbara.....	9,993		9,993	Do.
Santa Clara.....	37,160	3,660	40,820	Do.
Santa Cruz.....	164		164	Do.
Solana.....	1,896		1,896	Do.
Sonoma.....	34,111	4,640	38,751	Do.
Stanislaus.....	10,267	2,600	12,867	Do.
Ventura.....	740		740	Do.
Yolo.....	6,360	640	7,000	Do.
Total.....	949,558	42,533	992,091	
Susanneville:				
Lassen.....	983,133	24,521	1,007,654	Grazing, desert, timber, mineral.
Modoc.....	255,329	16,840	272,169	Do.
Plumas.....	7,983	2,691	10,674	Mountainous, timber, mineral.
Sierra.....	3,186		3,186	Do.
Total.....	1,249,631	43,952	1,293,583	
Visalia:				
Fresno.....	105,318	2,814	108,132	Mountainous, grazing.
Kern.....	97,830	26,724	124,554	Do.
Kings.....	12,884		12,884	Do.
Merced.....	4,118		4,118	Do.
Monterey.....	1,139		1,139	Do.
San Benito.....	4,530		4,530	Do.
Tulare.....	30,687	57,598	88,185	Do.
Total.....	256,406	87,136	343,542	
State total.....	15,237,248	4,348,553	19,585,801	

COLORADO.

Del Norte:				
Alamosa.....	30,782	3,840	34,622	Grazing.
Chaffee.....	2,597		2,597	Do.
Conejos.....	152,948		152,948	Do.
Huerfano.....	4,185	3,840	8,025	Do.
Las Animas.....		29,440	29,440	Do.
Rio Grande.....	58,435		58,435	Do.
Saguache.....	238,239		238,239	Do.
Total.....	487,190	37,120	524,310	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Denver:				
Adams.....	40	.....	40	Agricultural, grazing.
Boulder.....	800	.....	800	Mountainous, mineral.
Clear Creek.....	4,660	13,440	18,100	Do.
Douglas.....	800	.....	800	Arid, grazing, mineral.
Eagle.....	11,680	.....	11,680	Mountainous, grazing, mineral.
Elbert.....	400	.....	400	Agricultural, grazing.
Glipin.....	4,000	3,480	7,480	Mountainous, grazing, mineral.
Grand.....	102,720	33,060	135,780	Mountainous, grazing.
Jackson.....	234,790	.....	234,790	Do.
Jefferson.....	6,960	.....	6,960	Do.
Larimer.....	40,480	.....	40,480	Do.
Morgan.....	440	.....	440	Agricultural, grazing.
Routt.....	.....	7,680	7,680	Mountainous, grazing, mineral.
Summit.....	6,360	4,630	10,990	Do.
Weld.....	1,040	.....	1,040	Agricultural, grazing.
Total.....	415,160	62,650	477,810	
Durango:				
Archuleta.....	65,689	57,416	123,105	Agricultural, grazing, mineral, mountainous.
Dolores.....	32,400	25,160	57,560	Do.
La Plata.....	92,240	10,160	102,400	Do.
Montezuma.....	210,774	57,520	268,294	Do.
Total.....	401,103	150,256	551,359	
Glenwood Springs:				
Eagle.....	112,020	136,604	248,624	Farming, grazing, mineral.
Garfield.....	722,540	127,526	850,066	Do.
Gunnison.....	420	7,480	7,900	Do.
Mesa.....	109,684	31,460	141,144	Do.
Moffat.....	1,004,386	190,850	1,195,236	Do.
Pitkin.....	26,040	24,380	50,420	Grazing and mineral.
Rio Blanco.....	1,123,368	148,860	1,272,228	Farming and grazing.
Routt.....	164,143	127,829	291,972	Farming, grazing, mineral.
Total.....	3,262,801	794,989	4,057,590	
Hugo:				
Cheyenne.....	125	.....	125	Prairie farming and grazing.
Kit Carson.....	1,549	.....	1,549	Do.
Lincoln.....	516	.....	516	Do.
Total.....	2,190	.....	2,190	
Lamar:				
Baca.....	3,268	.....	3,268	Hilly, broken, grazing, small tracts.
Bent.....	1,018	.....	1,018	Rough, grazing, small tracts.
Kiowa.....	191	.....	191	Broken, grazing.
Las Animas.....	1,875	.....	1,875	Canyons, grazing, small tracts.
Lincoln.....	40	.....	40	Grazing.
Prowers.....	722	.....	722	Grazing, hilly, sandy.
Total.....	7,114	.....	7,114	
Leadville:				
Chaffee.....	78,040	.....	78,040	Grazing, agricultural, mineral, mountainous.
Fremont.....	32,460	.....	32,460	Grazing, agricultural, mineral.
Lake.....	7,582	.....	7,582	Grazing, mountainous, mineral.
Park.....	101,232	4,000	105,232	Grazing, agricultural, mineral.
Summit.....	465	.....	465	Grazing, mountainous, mineral.
Teller.....	4,200	.....	4,200	Grazing, agricultural, mineral.
Total.....	223,979	4,000	227,979	
Montrose:				
Delta.....	177,609	55,560	233,169	Mountainous, coal, grazing, farming.
Dolores.....	20,584	3,780	24,364	Mineral, grazing, arid.
Gunnison.....	414,320	89,040	503,360	Grazing, mountainous, coal, mineral, farming.
Hinsdale.....	104,010	11,200	115,210	Grazing, mountainous, mineral, timber, coal.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

COLORADO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Montrose—Continued.				
Mesa.....	607,847	181,683	789,530	Coal, farming, mineral, grazing.
Montrose.....	441,591	155,123	596,714	Do.
Ouray.....	18,365		18,365	Farming, grazing, mineral, mountainous.
Seguache.....	116,549		116,549	Farming, grazing, mineral, timber.
San Miguel.....	223,350	73,100	296,450	Farming, grazing, coal, rich mineral.
Total.....	2,124,226	569,486	2,693,711	
Pueblo:				
Alamosa.....	9,520		9,520	Mountainous.
Bent.....	320		320	Agricultural, grazing.
Crowley.....	399	500	899	Do.
Custer.....	8,239		8,239	Mountainous, grazing.
El Paso.....	1,577	1,320	2,897	Mountainous, grazing, agricultural.
Fremont.....	287,575		287,575	Do.
Huerfano.....	44,548		44,548	Do.
Kiowa.....		123	123	Grazing, agricultural.
Las Animas.....	38,290		38,290	Mountainous, agricultural, grazing.
Lincoln.....	520	760	1,270	Grazing, agricultural.
Otero.....	2,000		2,000	Do.
Pueblo.....	3,343		3,343	Agricultural, mountainous, grazing.
Seguache.....	17,400		17,400	Mountainous.
Teller.....	22,035		22,035	Largely mineral, mountainous, grazing.
Total.....	435,766	2,693	438,459	
Sterling:				
Logan.....	160		160	Sandy, grazing, agricultural.
Morgan.....	479		479	Sandy, grazing.
Phillips.....	120		120	Do.
Sedgwick.....	80		80	Do.
Washington.....	400		400	Do.
Weid.....	2,743	280	3,023	Do.
Yuma.....	920	480	1,400	Do.
Total.....	4,903	760	5,663	
State total.....	7,364,231	1,576,954	8,941,185	

FLORIDA.

Gainesville:				
Alachua.....	1,460		1,460	Low, pine.
Baker.....	440		440	Do.
Bay.....	5,153		5,153	Do.
Bradford.....	931		931	Do.
Brevard.....	14,302		14,302	Low, pine, swamp.
Calhoun.....	967		967	Low, pine.
Citrus.....	2,303		2,303	Do.
Clay.....	1,562		1,562	Do.
Columbia.....	1,634		1,634	Do.
De Soto.....	6,907		6,907	Do.
Escambia.....	1,230		1,230	Do.
Flagler.....	412		412	Do.
Gadsden.....	203		203	Do.
Hamilton.....	848		848	Do.
Hernando.....	640		640	Do.
Holmes.....	197		197	Do.
Jackson.....	227		227	Do.
Jefferson.....	203		203	Do.
Lafayette.....	5,411		5,411	Low, pine, swamp.
Lake.....	15,975		15,975	Low, pine.
Lee.....	7,705		7,705	Low, pine, swamp.
Leon.....	13		13	Low, pine.
Levy.....	3,994		3,994	Do.
Liberty.....	697		697	Do.
Madison.....	885		885	Do.
Manatee.....	1,033		1,033	Do.
Marion.....	6,540		6,540	Low, pine, scrub.
Monroe.....	2,190		2,190	Low, pine, swamp.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

FLORIDA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Gainesville—Continued.				
Nassau.....	342	.....	342	Low, pine.
Osceola.....	338	.....	338	Do.
Okaloosa.....	290	.....	290	Do.
Orange.....	1,485	.....	1,485	Do.
Pasco.....	486	.....	486	Do.
Polk.....	2,441	.....	2,441	Do.
Putnam.....	6,509	.....	6,509	Do.
St. Johns.....	1,103	.....	1,103	Do.
St. Lucie.....	639	.....	639	Do.
Santa Rosa.....	279	.....	279	Do.
Seminole.....	870	.....	870	Do.
Sumter.....	200	.....	200	Do.
Suwanee.....	374	.....	374	Do.
Taylor.....	2,480	.....	2,480	Do.
Volusia.....	9,858	.....	9,858	Do.
Wakulla.....	240	.....	240	Do.
Walton.....	7,151	.....	7,151	Do.
Washington.....	1,936	.....	1,936	Do.
State total.....	120,077	.....	120,077	

IDAHO.

Blackfoot:				
Bannock.....	58,720	13,740	72,460	Grazing, mountainous.
Bear Lake.....	35,900	7,500	43,400	Do.
Bingham.....	262,341	56,920	319,261	Lava, dry farming.
Bonneville.....	20,600	31,360	51,960	Do.
Butte.....	92,800	45,000	137,800	Do.
Caribou.....	8,180	.....	8,180	Grazing, mountainous.
Clark.....	196,140	96,040	292,180	Dry farming.
Franklin.....	6,480	.....	6,480	Mountainous.
Fremont.....	40,920	.....	40,920	Dry farming.
Jefferson.....	191,540	68,400	259,940	Do.
Lemhi.....	.....	1,920	1,920	Mountainous.
Madison.....	13,580	.....	13,580	Do.
Oneida.....	90,800	39,040	129,840	Do.
Power.....	56,480	.....	56,480	Do.
Teton.....	640	.....	640	Do.
Total.....	1,075,121	359,920	1,435,041	
Boise:				
Ada.....	133,312	.....	133,312	Arid and mountainous.
Adams.....	39,970	.....	39,970	Mountainous, grazing, timber.
Boise.....	100,182	7,880	108,062	Mountainous, timber, mineral, grazing.
Canyon.....	19,274	.....	19,274	Arid and grazing.
Elmore.....	103,184	25,280	128,464	Arid, grazing, mineral, timber, mountainous.
Gem.....	42,618	.....	42,618	Arid, mountainous, grazing, timber.
Idaho.....	20,680	136,850	157,530	Arid, mountainous, mineral, grazing, timber.
Owyhee.....	2,035,438	1,168,520	3,203,958	Do.
Payette.....	45,982	.....	45,982	Arid, grazing, mountainous, timber.
Valley.....	12,321	.....	12,321	Arid, mountainous, grazing, timber, mineral.
Washington.....	134,079	.....	134,079	Do.
Total.....	2,687,040	1,338,530	4,025,570	
Coeur d'Alene:				
Benewah.....	22,208	.....	22,208	Agricultural, grazing, timbered.
Bonner.....	19,608	.....	19,608	Agricultural, grazing, timbered, and mineral.
Boundary.....	4,582	7,040	11,622	Do.
Kootenai.....	18,623	.....	18,623	Agricultural, grazing, and timbered.
Shoshone.....	69,427	10,240	79,667	Agricultural, grazing, timbered, and mineral.
Total.....	124,533	17,280	151,813	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

IDAHO—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Hailey:				
Bingham.....		11,520	11,520	Lava and sagebrush plains.
Blaine.....	124,578	242,860	474,438	Mountainous, grazing, sagebrush.
Butte.....	113,044	168,120	275,164	Do.
Camae.....	80,645	18,640	99,285	Grazing, sagebrush, somewhat mountainous.
Cassia.....	157,705	4,480	162,185	Mountainous, grazing, sagebrush.
Custer.....	187,175	242,609	429,875	Do.
Elmore.....	10,542	14,720	25,362	Lava, sagebrush plains.
Gooding.....	71,786	10,800	82,086	Mountainous, grazing, sagebrush.
Jerome.....	207,780	28,000	235,780	Lava and sagebrush plains.
Lamhi.....	324,640	194,760	519,400	Do.
Lincoln.....	39,420	130,620	220,040	Grazing and sagebrush plains.
Minidoka.....	52,427	96,720	149,147	Lava and sagebrush plains.
Owyhee.....	90,769	77,862	168,631	Grazing and sagebrush plains.
Power.....	26,805	68,120	95,425	Mountainous, grazing, sagebrush.
Twin Falls.....	108,216	40,962	144,178	Grazing and sagebrush plains.
Valley.....	12,976	12,064	25,081	Do.
Total.....	1,652,095	1,460,437	3,112,532	
Lewiston:				
Clearwater.....	25,953		25,953	Mountainous.
Idaho.....	37,477		37,477	Mountainous, grazing.
Latah.....	1,057		1,057	Mountainous.
Lewis.....	4,200		4,200	Mountainous, grazing.
Nes Perce.....	9,379		9,379	Do.
Shoshone.....	2,090		2,090	Mountainous.
Total.....	80,156		80,156	
State total.....	5,628,945	3,176,167	8,805,112	

KANSAS.

Topoka:				
Barber.....	120		120	Broken, sandy.
Cheyenne.....	317		317	Rough and broken.
Clark.....	388		388	Broken, sandy.
Comanche.....	200		200	Do.
Edwards.....	131		131	Do.
Ellis.....	40		40	Rough and broken.
Gove.....	160		160	Do.
Hamilton.....	240		240	Broken, sandy.
Kearney.....	40		40	Do.
Kiowa.....	80		80	Do.
Lane.....	360		360	Grazing, broken.
Logan.....	40		40	Rough and broken.
Meade.....	176		176	Broken, sandy.
Morton.....	486		486	Do.
Osborne.....	40		40	Rough and broken.
Rawlins.....	320		320	Do.
Rice.....	80		80	Sandy.
Scott.....	320		320	Grazing, broken.
Seward.....	238		238	Broken, sandy.
Sherman.....	42		42	Rough and broken.
Stafford.....	41		41	Swampy.
Stanton.....	40		40	Grazing, broken.
Stevens.....	527		527	Broken, sandy.
Trego.....	40		40	Rough and broken.
Wichita.....	80		80	Grazing, broken.
State total.....	4,346		4,346	

LOUISIANA.

Baton Rouge:				
Acadia.....	6		6	Prairie.
Allen.....	78		78	Pine woods.
Ascension.....	55		55	Swampy.
Avoyelles.....	391		391	Prairie, pine woods.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

LOUISIANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Baton Rouge—Continued.				
Beauregard.....	80	.....	80	Pine woods.
Bienville.....	149	.....	149	High, pine woods.
Bossier.....	91	.....	91	Do.
Caddo.....	6	.....	6	Do.
Calcasieu.....	1,700	.....	1,700	Prairie, pine woods.
Caldwell.....	787	.....	787	High, pine woods.
Cameron.....	258	.....	258	Prairie, marsh.
Catahoula.....	265	.....	265	High, pine woods.
Chalborne.....	80	.....	80	Pine woods.
Comcordia.....	16	.....	16	Alluvial.
De Soto.....	80	.....	80	High, pine woods.
East Baton Rouge.....	12	.....	12	Pine.
East Carroll.....	877	.....	877	Low, pine woods.
East Feliciana.....	10	.....	10	Pine woods.
Franklin.....	12	.....	12	Pine woods, hilly.
Grant.....	80	.....	80	Do.
Iberia.....	324	.....	324	Prairie, marsh.
Lafourche.....	289	.....	289	Agricultural.
La Salle.....	74	.....	74	Pine woods.
Lincoln.....	40	.....	40	Agricultural.
Livingston.....	59	.....	59	Hardwood.
Madison.....	14	.....	14	Low, pine woods.
Morehouse.....	100	.....	100	Pine woods.
Natchitoches.....	80	.....	80	Do.
Orachita.....	124	.....	124	Do.
Plaquemines.....	1,729	.....	1,729	Prairie, marsh.
Pointe Coupee.....	822	.....	822	Farming, swamp.
Rapides.....	78	.....	78	Agricultural.
Richland.....	110	.....	110	Do.
Sabine.....	223	.....	223	Do.
St. Charles.....	10	.....	10	Do.
St. Helena.....	10	.....	10	Pine woods.
St. James.....	240	.....	240	Farming, swamp.
St. John.....	1,049	.....	1,049	Farming, swampy.
St. Landry.....	32	.....	32	Prairie, pine.
St. Martin.....	69	.....	69	Prairie, swampy.
St. Mary.....	465	.....	465	Do.
St. Tammany.....	283	.....	283	Pine woods.
Tangipahoa.....	24	.....	24	Do.
Tensas.....	13	.....	13	Alluvial.
Terrebonne.....	3,101	.....	3,101	Low, swampy.
Union.....	260	.....	260	Pine woods.
Vermilion.....	40	.....	40	Prairie.
Vernon.....	80	.....	80	Pine woods.
Washington.....	75	.....	75	Do.
Webster.....	40	.....	40	Do.
West Feliciana.....	265	.....	265	Do.
Winn.....	120	.....	120	Do.
State total.....	14,240	.....	14,240	

MICHIGAN.

Marquette:				
Alcona.....	440	.....	440	Light soil.
Alger.....	1,780	.....	1,780	Fair farming.
Alpena.....	200	.....	200	Do.
Antrim.....	129	.....	129	Do.
Baraga.....	4,450	.....	4,450	Do.
Benzie.....	240	.....	240	Do.
Charlevoix.....	989	.....	989	Do.
Cheboygan.....	720	.....	720	Do.
Chippewa.....	9,561	.....	9,561	Timbered, fair farming.
Clare.....	530	.....	530	Fair farming.
Crawford.....	1,300	.....	1,300	Do.
Delta.....	4,280	.....	4,280	Do.
Dickinson.....	680	.....	680	Do.
Gladwin.....	40	.....	40	Fair farming.
Grand Traverse.....	551	.....	551	Do.
Houghton.....	95	.....	95	Do.
Iosco.....	400	.....	400	Light soil.
Iron.....	320	.....	320	Fair farming.
Jackson.....	76	.....	76	Wet.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

MICHIGAN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Marquette—Continued.				
Kalkaska.....	2,159	.....	2,159	Light soil.
Keweenaw.....	11,186	.....	11,186	Do.
Lake.....	280	.....	280	Do.
Leelanau.....	1,909	.....	1,909	Fair farming.
Luca.....	3,102	.....	3,102	Do.
Mackinac.....	1,683	.....	1,683	Do.
Marquette.....	6,030	.....	6,030	Timbered, fair farming.
Mason.....	30	.....	30	Fair farming.
Menominee.....	640	.....	640	Do.
Missaukee.....	280	.....	280	Do.
Montmorency.....	1,524	.....	1,524	Do.
Oakland.....	40	.....	40	Wet.
Oceana.....	915	.....	915	Very sandy.
Ogemaw.....	240	.....	240	Sandy, light.
Ontonagon.....	460	.....	460	Timbered, farming.
Oscoda.....	1,973	.....	1,973	Light soil.
Otsego.....	516	.....	516	Fair farming.
Presque Isle.....	1,280	.....	1,280	Do.
Roscommon.....	1,300	.....	1,300	Do.
Schoolcraft.....	11,135	.....	11,135	Do.
State total.....	73,523	.....	73,523	

MINNESOTA.

Cass Lake:				
Beltrami.....	4,720	.....	4,720	Swampy generally.
Cass.....	1,260	.....	1,260	Do.
Hubbard.....	120	.....	120	Swamp and agricultural.
Itasca.....	1,160	.....	1,160	Timbered, agricultural.
Koochiching.....	84,690	.....	84,690	Swampy and timbered generally
Total.....	91,950	.....	91,950	
Crookston:				
Becker.....	44	.....	44	Swamp, brush.
Beltrami.....	103,403	.....	103,403	Swamp, some timber.
Clearwater.....	1,444	.....	1,444	Swampy, cut-over land.
Kittson.....	14	.....	14	Sandy, river shore.
Pennington.....	83	.....	83	Rough, brush and small timber.
Roseau.....	5,097	.....	5,097	Swamp, some timber.
Total.....	110,085	.....	110,085	
Duluth:				
Aitkin.....	320	.....	320	Low, wet.
Carlton.....	160	.....	160	Swamp.
Cass.....	400	.....	400	Low, wet, sandy.
Cook.....	10,600	.....	10,600	Broken, rough, swamp.
Crow Wing.....	100	.....	100	Fractional lots.
Hubbard.....	40	.....	40	Swamp.
Kandiyohi.....	80	.....	80	Do.
Koochiching.....	20,480	.....	20,480	Swamp, spruce, agricultural.
Lake.....	3,600	.....	3,600	Rocky, broken.
Mille Lacs.....	13	.....	13	Fractional lots.
Morrison.....	64	.....	64	Lowland.
Otter Tail.....	55	.....	55	Fractional lots.
Pine.....	440	.....	440	Sandy lowlands.
Sibley.....	40	.....	40	Swamp.
St. Louis.....	17,600	.....	17,600	Broken, swamp, agricultural.
Wabasha.....	200	.....	200	Sandy lowlands.
Wadena.....	70	.....	70	Swamp.
Total.....	54,262	.....	54,262	
State total.....	256,297	.....	256,297	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

MISSISSIPPI.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Jackson:				
Adams.....	1,240		1,240	Agricultural, timbered
Amite.....	320		320	Do.
Attala.....	1,257		1,257	Do.
Carroll.....	240		240	Do.
Choctaw.....	200		200	Do.
Clalborne.....	1,355		1,355	Do.
Clarke.....	680		680	Do.
Copiah.....	320		320	Do.
Covington.....	120		120	Do.
Forrest.....	380		380	Pine woods, farming.
Franklin.....	800		800	Agricultural, timbered.
George.....	2,256		2,256	Pine belt, grazing.
Greene.....	3,384		3,384	Agricultural, timbered.
Grenada.....	1,240		1,240	Do.
Hancock.....	895		895	Do.
Harrison.....	463		463	Do.
Hinds.....	300		300	Do.
Holmes.....	80		80	Do.
Issaquena.....	15		15	Do.
Jackson.....	4,236		4,236	Do.
Jasper.....	160		160	Do.
Jefferson.....	1,450		1,450	Do.
Jefferson Davis.....	40		40	Farming, some broken.
Jones.....	400		400	Agricultural, timbered.
Kemper.....	320		320	Do.
Lauderdale.....	400		400	Pine woods, farming.
Leake.....	440		440	Pine belt, grazing.
Lincoln.....	40		40	Farming, timber, grazing.
Lowndes.....	240		240	Agricultural, timbered.
Marion.....	60		60	Farming.
Monroe.....	920		920	Do.
Montgomery.....	900		900	Agricultural, timbered.
Neshoba.....	80		80	Level farming, grazing.
Newton.....	40		40	Agricultural, timbered.
Noxubee.....	80		80	Do.
Pearl River.....	326		326	Do.
Perry.....	1,320		1,320	Do.
Quitman.....	6		6	Do.
Scott.....	40		40	Do.
Simpson.....	40		40	Do.
Smith.....	60		60	Do.
Stone.....	320		320	Do.
Sunflower.....	23		23	Do.
Warren.....	500		500	Do.
Wayne.....	2,120		2,120	Do.
Webster.....	1,327		1,327	Do.
Wilkinson.....	1,120		1,120	Do.
Winston.....	287		287	Do.
Yalobusha.....	520		520	Swampy, farming.
State total.....	33,360		33,360	

MISSOURI.

Springfield:				
Carter.....	10		10	Rough and hilly
Shannon.....	8		8	Do.
Total.....	18		18	

MONTANA.

Billings:				
Big Horn.....	6,429	15,360	21,789	Mountainous, grazing.
Carbon.....	129,938	74,814	204,753	Do.
Musselshell.....	1,258		1,258	Do.
Rosebud.....	2,438		2,438	Do.
Sullywater.....	886		886	Do.
Yellowstone.....	4,224		4,224	Do.
Total.....	145,173	90,174	235,347	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

MONTANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Bozeman:				
Beaverhead.....	17,924	47,520	65,444	Grazing and mountainous.
Broadwater.....	10,835		10,835	Do.
Carbon.....	6,082		6,082	Do.
Gallatin.....	20,124		20,124	Do.
Jefferson.....	8,230	8,723	16,953	Do.
Madison.....	52,654	31,607	84,261	Do.
Park.....	23,430	4,220	27,650	Do.
Stillwater.....	32,380		32,380	Do.
Sweet Grass.....	56,566	1,440	58,006	Do.
Total.....	228,185	93,510	321,695	
Glasgow:				
Garfield.....	35,380		35,380	Grazing and dry farming.
McCone.....	47,436		47,436	Do.
Phillips.....	404,220	23,040	427,260	Do.
Richland.....	5,820		5,820	Do.
Roosevelt.....	41,120		41,120	Do.
Sheridan.....	39,120		39,120	Do.
Valley.....	257,250	368,640	625,890	Do.
Total.....	830,346	391,680	1,222,026	
Great Falls:				
Cascade.....	16,422	1,440	17,862	Grazing, agricultural.
Chouteau.....	18,176		18,176	Do.
Fergus.....	359		359	Do.
Glacier.....	709		709	Do.
Hill.....	40		40	Do.
Lewis and Clark.....	2,937		2,937	Grazing, agricultural, mountainous.
Liberty.....	2,441		2,441	Grazing, agricultural.
Pondera.....	2,235		2,235	Do.
Teton.....	8,667	22,480	31,147	Do.
Toole.....	12,507		12,507	Do.
Total.....	64,498	23,920	88,418	
Havre:				
Blaine.....	120,842	176,440	297,282	Mountainous agricultural, grazing.
Chouteau.....	63,280		63,280	Do.
Hill.....	43,921		43,921	Do.
Liberty.....	20,415		20,415	Do.
Phillips.....	160,880	235,000	395,880	Do.
Toole.....	9,960		9,960	Do.
Total.....	419,298	411,440	830,738	
Helena:				
Beaverhead.....	368,833	278,140	646,973	Grazing.
Broadwater.....	20,180	17,800	37,980	Do.
Cascade.....	2,520		2,520	Do.
Deer Lodge.....	10,240		10,240	Do.
Gallatin.....	1,120		1,120	Do.
Jefferson.....	39,760	21,000	60,760	Do.
Lewis and Clark.....	83,165	36,560	119,725	Do.
Madison.....	133,800	43,200	177,000	Do.
Meagher.....	7,640		7,640	Do.
Powell.....	55,460	42,620	98,080	Do.
Silver Bow.....	84,560		84,560	Do.
Teton.....	1,600	1,120	2,720	Do.
Total.....	758,878	440,440	1,199,318	
Kalspell:				
Flathead.....	22,175	320	22,495	Covered with brush, stumps, and unmerchantable timber.
Lincoln.....	5,360		5,360	Do.
Sanders.....	960		960	Do.
Teton.....	880	3,840	4,700	Grazing, rough.
Total.....	29,365	4,160	33,515	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

MONTANA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Lewistown:				
Chouteau.....	10,920	.....	10,920	Rough, bad lands, grazing.
Fergus.....	241,126	23,000	264,126	Mineral, rough, grazing.
Garfield.....	122,352	5,410	127,762	Rough, grazing, bad lands.
Musselshell.....	17,672	.....	17,672	Rough, hilly, and mountainous.
Rosebud.....	1,000	.....	1,000	Bad lands, broken, grazing.
Sweetgrass.....	520	.....	520	Grazing and farming.
Wheatland.....	1,173	.....	1,173	Rough, grazing, some farming.
Total.....	405,293	31,000	436,293	
Miles City:				
Big Horn.....	52,311	5,112	57,424	Grazing and agricultural.
Carter.....	117,795	225,086	342,881	Do.
Custer.....	26,784	.....	26,784	Do.
Dawson.....	1,067	.....	1,067	Do.
Fallon.....	1,338	.....	1,338	Do.
Garfield.....	412,067	66,000	478,067	Do.
McCone.....	60,997	18,979	79,976	Do.
Powder River.....	124,717	.....	124,717	Do.
Prairie.....	1,337	.....	1,337	Do.
Richland.....	580	.....	580	Do.
Rosebud.....	123,284	12,049	135,333	Do.
Treasure.....	337	.....	337	Do.
Wibaux.....	2,124	.....	2,124	Do.
Total.....	934,758	328,177	1,262,935	
Missoula:				
Beaverhead.....	35,968	9,000	44,968	Arid, grazing.
Granite.....	10,012	93,180	103,192	Mountainous, timber, mineral.
Mineral.....	56,889	.....	56,889	Do.
Missoula.....	10,056	37,686	47,692	Do.
Powell.....	24,377	20,880	45,257	Do.
Ravalli.....	1,700	388	2,088	Mountainous, timber, grazing.
Sanders.....	3,275	34,000	37,275	Mountainous, timber, mineral.
Total.....	148,277	195,084	343,361	
State total.....	3,964,156	2,009,585	5,973,741	

NEBRASKA.

Allamore:				
Banner.....	480	.....	480	Prairie, table land.
Box Butte.....	160	.....	160	Do.
Brown.....	880	.....	880	Sandy, grazing, small valleys.
Cherry.....	20,420	.....	20,420	Do.
Dawes.....	1,230	.....	1,230	Rough, grazing.
Garden.....	5,085	.....	5,085	Sand hill, grazing.
Morrill.....	5,080	.....	5,080	Do.
Rock.....	440	.....	440	Do.
Scotts Bluff.....	1,480	.....	1,480	Rough, grazing.
Sheridan.....	3,090	.....	3,090	Sand hill, grazing.
Sioux.....	2,200	.....	2,200	Rough, grazing.
Total.....	40,545	.....	40,545	
Broken Bow:				
Arthur.....	1,844	.....	1,844	Grazing.
Blaine.....	1,394	.....	1,394	Do.
Banner.....	40	.....	40	Do.
Brown.....	1,441	.....	1,441	Do.
Cherry.....	2,888	.....	2,888	Do.
Cheyenne.....	40	.....	40	Do.
Garden.....	840	.....	840	Do.
Grant.....	1,495	.....	1,495	Do.
Hooker.....	4,282	.....	4,282	Do.
Kimball.....	40	.....	40	Do.
Lincoln.....	720	.....	720	Do.
Logan.....	761	.....	761	Do.
McPherson.....	2,244	.....	2,244	Do.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

NEBRASKA—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Broken Bow—Continued.				
Morrill.....	320	.....	320	Grazing.
Thomas.....	2,955	.....	2,955	Do.
Total.....	21,304	.....	21,304	
Lincoln:				
Boone.....	72	.....	72	Rough, sandy.
Boyd.....	534	.....	534	Overflowed bottom, rough.
Buffalo.....	28	.....	28	Overflowed bottom.
Burt.....	442	.....	442	Do.
Chase.....	240	.....	240	Broken, sandy, grazing.
Dundy.....	280	.....	280	Do.
Frontier.....	120	.....	120	Do.
Garfield.....	489	.....	489	Rough, sandy.
Hayes.....	560	.....	560	Broken, grazing.
Hitchcock.....	362	.....	362	Broken, sandy, grazing.
Holt.....	277	.....	277	Rough, sandy.
Kays Paha.....	14	.....	14	Overflowed bottom.
Knox.....	177	.....	177	Do.
Loup.....	895	.....	895	Rough, sandy.
Red Willow.....	36	.....	36	Broken, grazing.
Rock.....	80	.....	80	Rough, sandy.
Sarpy.....	18	.....	18	Overflowed bottom.
Washington.....	280	.....	280	Do.
Webster.....	11	.....	11	Do.
Wheeler.....	80	.....	80	Rough, sandy.
Total.....	4,995	.....	4,995	
State total.....	66,844	.....	66,844	

NEVADA.

Carson City:				
Churchill.....	1,071,173	1,234,047	2,305,220	Mountainous, arid, grazing, little timber.
Clark.....	3,232,669	1,269,608	4,502,277	Do.
Douglas.....	182,136	4,402	186,538	Do.
Esmeralda.....	1,060,842	906,528	1,967,370	Do.
Eureka.....	18,201	40,071	58,272	Mountainous, arid, grazing.
Humboldt.....	1,157,452	2,666,288	3,823,735	Do.
Lander.....	103,296	26,793	130,089	Do.
Lincoln.....	2,104,967	3,935,444	6,040,411	Do.
Lyon.....	316,882	208,051	524,933	Do.
Mineral.....	1,206,343	620,803	1,830,146	Mountainous, arid, little timber.
Nye.....	3,363,661	5,481,048	8,844,709	Mountainous, arid, grazing, little timber.
Ormsby.....	23,745	19,980	43,725	Mountainous, arid, grazing, second-growth timber.
Pershing.....	1,533,497	921,784	2,455,281	Mountainous, arid, grazing.
Storey.....	97,790	1,272	99,062	Do.
Washoe.....	2,356,842	510,016	2,866,858	Mountainous, arid, grazing, second-growth timber.
White Pine.....	.....	19,300	19,300	Mountainous, arid, grazing, little timber.
Total.....	17,832,496	17,865,430	35,697,926	
Elko:				
Churchill.....	127,430	7,000	134,430	Mountainous, arid, grazing, little timber.
Elko.....	6,294,382	623,333	6,917,715	Do.
Eureka.....	1,028,620	4,067,513	2,096,133	Do.
Humboldt.....	1,393,497	199,426	1,592,923	Mountainous, arid, grazing, no timber.
Lander.....	882,583	1,088,963	1,971,546	Do.
Lincoln.....	638,993	101,184	740,177	Do.
Nye.....	426,749	147,103	573,852	Mountainous, arid, grazing, little timber.
White Pine.....	2,833,222	1,706,261	4,542,483	Mountainous, arid, grazing, no timber.
Total.....	13,625,476	4,943,773	18,569,249	
State total.....	31,457,972	22,809,203	54,267,175	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

NEW MEXICO.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Clayton:				
Colfax.....	9,920	.....	9,920	Arid, broken, grazing.
Mora.....	6,839	.....	6,839	Grazing mostly, some broken.
Quay.....	2,077	.....	2,077	Grazing.
San Miguel.....	5,942	.....	5,942	Do.
Union.....	86,902	.....	86,902	Grazing, broken.
Total.....	111,680	.....	111,680	
Fort Sumner:				
Chaves.....	198,100	.....	198,100	Broken, grazing.
Curry.....	3,600	.....	3,600	Grazing.
De Baca.....	198,700	.....	198,700	Do.
Guadalupe.....	122,280	.....	122,280	Do.
Lincoln.....	351,120	.....	351,120	Do.
Roosevelt.....	16,400	.....	16,400	Broken, grazing.
Total.....	885,200	.....	885,200	
Las Cruces:				
Dona Ana.....	1,412,534	201,492	1,614,026	Grazing, mountainous.
Grant.....	267,260	343,387	610,647	Do.
Hidalgo.....	750,000	232,000	982,000	Do.
Lincoln.....	180,870	.....	180,870	Do.
Luna.....	809,348	160,313	969,661	Do.
• Otero.....	1,353,289	46,143	1,399,432	Do.
Sierra.....	1,133,000	210,011	1,343,011	Do.
Socorro.....	2,226,456	617,226	2,843,682	Do.
Total.....	8,132,757	1,810,572	9,943,329	
Roswell:				
Chaves.....	767,000	226,900	993,900	Grazing, rolling prairie.
Eddy.....	1,012,340	192,540	1,204,880	Mostly prairie, timber in mountains.
Lea.....	295,440	20,480	315,920	Grazing, rolling prairie.
Lincoln.....	279,520	128,960	408,480	Grazing, timber in mountains.
Otero.....	95,720	640,120	735,840	Grazing.
Roosevelt.....	8,640	.....	8,640	Do.
Socorro.....	2,080	81,920	84,000	Undulating prairie.
Torrance.....	12,780	.....	12,780	Prairie, grazing.
Total.....	2,473,520	1,290,920	3,764,440	
Santa Fe:				
Bernalillo.....	39,580	19,591	59,171	Timber, grazing, agricultural.
Colfax.....	906	.....	906	Mountainous, grazing, coal.
Guadalupe.....	39,513	2,343	41,856	Grazing, agricultural.
McKinley.....	241,112	114,000	355,112	Mountainous, timber, grazing, coal.
Mora.....	6,370	.....	6,370	Mountainous, grazing, coal, agricul-
				tural.
Rio Arriba.....	519,800	14,865	534,665	Do.
Sandoval.....	410,893	69,120	480,013	Do.
San Juan.....	690,825	11,029	701,854	Grazing, agricultural, coal.
San Miguel.....	69,223	.....	69,223	Timber, grazing, agricultural.
Santa Fe.....	22,147	3,946	26,093	Mountainous, grazing, coal.
Socorro.....	440,055	17,940	457,995	Do.
Taos.....	103,800	124,700	228,500	Mountainous, grazing, timber, agri-
				cultural.
Torrance.....	30,035	31,859	61,894	Timber, grazing, saline, agricultural.
Valencia.....	640,009	8,063	648,092	Do.
Total.....	3,254,268	417,476	3,671,744	
Tucumcari:				
Curry.....	700	.....	700	Agricultural, grazing, some broken.
De Baca.....	1,000	.....	1,000	Do.
Guadalupe.....	10,380	.....	10,380	Broken, grazing.
Quay.....	34,315	5,300	39,615	Grazing, part broken.
San Miguel.....	3,480	.....	3,480	Broken, grazing.
Union.....	8,570	8,740	17,310	Rolling, grazing.
Total.....	58,445	14,040	72,485	
State total.....	14,915,870	3,533,008	18,448,878	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

NORTH DAKOTA.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Bismarck:				
Burleigh.....	48		48	Agricultural and grazing.
Emmons.....	46		46	Do.
Grant.....	42		42	Do.
Kidder.....	489		489	Do.
McIntosh.....	80		80	Do.
McLean.....	189		189	Do.
Mercer.....	138		138	Do.
Morton.....	165		165	Do.
Oliver.....	40		40	Do.
Richland.....	40		40	Do.
Sioux ¹	1,777		1,777	Do.
Stutsman.....	200		200	Do.
Total.....	3,254		3,254	
Dickinson:				
Billings.....	8,372		8,372	Rough, grazing.
Bowman.....	17,367		17,367	Do.
Dunn.....	7,289		7,289	Do.
Golden Valley.....	1,467		1,467	Do.
McKenzie.....	11,731		11,731	Do.
Slope.....	1,845		1,845	Do.
Total.....	48,071		48,071	
Minot:				
Benson.....	500		500	Grazing.
Bottineau.....	45		45	Do.
Burke.....	204		204	Do.
Foster.....	158		158	Low, swampy.
McHenry.....	776		776	Grazing.
McLean.....	221		221	Do.
Mountrail.....	4,952		4,952	Do.
Pierce.....	324		324	Do.
Renville.....	238		238	Do.
Sheridan.....	40		40	Do.
Ward.....	656		656	Do.
Walsh.....	40		40	Do.
Total.....	8,154		8,154	
Williston:				
Divide.....	1,765		1,765	Broken, grazing.
McKenzie.....	12,347		12,347	Broken, grazing, farming.
Mountrail.....	1,576		1,576	Broken, grazing.
Williams.....	5,877		5,877	Broken, grazing, farming.
Total.....	21,565		21,565	
State total.....	81,044		81,044	

OKLAHOMA.

Guthrie:				
Blaine.....	530		530	Grazing.
Canadian.....	204		204	Sandy, grazing.
Cimarron.....	760		760	Grazing.
Cleveland.....	71		71	Sandy, grazing.
Custer.....	222		222	Grazing.
Dewey.....	1,075		1,075	Do.
Ellis.....	1,691		1,691	Sandy, grazing.
Harmon.....	35		35	Rough, grazing.
Jackson.....	31		31	Sandy, grazing.
Kingfisher.....	3		3	Do.
Logan.....	9		9	Do.
Major.....	506		506	Rough, grazing.
Roger Mills.....	1,560		1,560	Do.
Woods.....	320		320	Do.
Woodward.....	383		383	Grazing.
State total.....	7,404		7,404	

¹ Also see Lemmon, S. Dak., report for remainder of Sioux County.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

OREGON.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Burns:				
Crook.....	54,554	.....	54,554	Grazing, timber, and farming.
Grant.....	68,531	480	69,011	Do.
Harney.....	3,370,311	25,791	3,406,102	Do.
Wheeler.....	4,860	.....	4,860	Do.
Total.....	3,498,256	36,271	3,534,527	
La Grande:				
Baker.....	156,240	586	156,826	Timbered, mountainous, grazing, mineral, and farming.
Grant.....	26,760	.....	26,760	Timbered, farming, grazing, and mineral.
Morrow.....	2,160	.....	2,160	Timbered, farming, and grazing.
Umatilla.....	21,080	291	21,371	Timbered, farming, grazing, and arid.
Union.....	4,920	.....	4,920	Timbered, farming, and grazing.
Walla.....	22,000	.....	22,000	Mountainous, farming, and grazing.
Total.....	233,160	877	234,037	
Lakeview:				
Crook.....	48,596	.....	48,596	Agricultural, mountainous, grazing.
Deschutes.....	362,439	.....	362,439	Do.
Klamath.....	1,022,305	95,232	1,117,537	Agricultural, timber, grazing.
Lake.....	2,608,589	134,262	2,637,851	Agricultural, mountainous, timber, and grazing.
Total.....	3,936,929	229,494	4,166,423	
Portland:				
Benton.....	10,645	.....	10,645	Broken, grazing, agricultural.
Clackamas.....	30,751	.....	30,751	Hilly, broken, grazing, agricultural.
Clatsop.....	1,516	.....	1,516	Do.
Columbia.....	720	.....	720	Do.
Linn.....	11,132	.....	11,132	Do.
Lincoln.....	23,726	.....	23,726	Do.
Marion.....	8,037	.....	8,037	Do.
Multnomah.....	713	.....	713	Do.
Polk.....	3,115	.....	3,115	Do.
Tillamook.....	36,275	.....	36,275	Do.
Washington.....	2,441	.....	2,441	Do.
Yamhill.....	10,718	.....	10,718	Do.
Total.....	139,789	.....	139,789	
Roseburg:				
Benton.....	13,747	960	14,707	Timber, grazing.
Coos.....	41,358	.....	41,358	Do.
Curry.....	36,532	2,100	38,632	Mountainous, timber.
Douglas.....	194,236	2,560	196,796	Mineral, grazing, timber.
Jackson.....	272,383	.....	272,383	Timber, grazing, fruit.
Josephine.....	115,320	6,320	121,640	Timber, grazing, mineral, fruit.
Klamath.....	3,946	.....	3,946	Timber.
Lane.....	96,016	.....	96,016	Timber, grazing, mineral.
Lincoln.....	1,915	.....	1,915	Broken, grazing.
Linn.....	1,212	.....	1,212	Hilly, grazing.
Total.....	776,665	11,940	788,605	
The Dalles:				
Crook.....	143,732	1,260	144,992	Grazing, broken, hilly, and mountainous.
Deschutes.....	100,130	.....	100,130	Do.
Gilliam.....	1,240	1,760	3,000	Do.
Grant.....	13,700	.....	13,700	Do.
Jefferson.....	4,000	5,120	9,120	Do.
Morrow.....	500	.....	500	Do.
Sherman.....	8,400	640	9,040	Do.
Wasco.....	9,240	.....	9,240	Do.
Wheeler.....	6,680	.....	6,680	Do.
Total.....	287,622	8,780	296,402	

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

OREGON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Vale:				
Baker.....	55,251	.....	55,251	Grazing, dry farming, timber.
Grant.....	11,169	.....	11,169	Mountainous, timber.
Harney.....	415,183	.....	415,183	Grazing, dry farming.
Malheur.....	3,905,341	460,080	4,365,371	Grazing, dry farming, some timber.
Total.....	4,386,944	460,080	4,846,974	
State total.....	13,259,365	747,392	14,006,757	

SOUTH DAKOTA.

Bellevue:				
Butte.....	58,540	.....	58,540	Rolling, broken, grazing.
Harding.....	15,560	.....	15,560	Do.
Meade.....	1,800	.....	1,800	Broken, grazing.
Total.....	75,900	.....	75,900	
Gregory:				
Bennett.....	3,265	.....	3,265	Grazing, sand hills.
Gregory.....	201	.....	201	Very rough, grazing.
Mellette.....	2,418	.....	2,418	Rough, grazing and rolling.
Total.....	5,884	.....	5,884	
Lemmon:				
Corson.....	305	.....	305	Rough, partly on river bottom.
Harding.....	10,440	.....	10,440	Very rough.
Perkins.....	8,760	.....	8,760	Do.
Sioux (N. Dak.).....	334	.....	334	Rough.
Total.....	19,839	.....	19,839	
Pierre:				
Brule.....	440	.....	440	Rough, hilly, grazing.
Campbell.....	645	.....	645	Do.
Charles Mix.....	96	.....	96	Do.
Coddington.....	1	.....	1	Low, wet, on lake.
Day.....	12	.....	12	Do.
Deuel.....	7	.....	7	Do.
Edmunds.....	240	.....	240	Do.
Haakon.....	4,725	.....	4,725	Rough, hilly, grazing.
Hand.....	29	.....	29	Do.
Hughes.....	108	.....	108	Do.
Jackson.....	18,110	.....	18,110	Rough, hilly, mountainous, grazing.
Kingsbury.....	1	.....	1	Low and wet, on lake.
Lyman.....	160	.....	160	Rough, hilly, grazing.
Potter.....	40	.....	40	Do.
Spink.....	40	.....	40	Low, wet, in lake.
Stanley.....	7,875	.....	7,875	Rough, hilly, grazing.
Sully.....	190	.....	190	Do.
Walworth.....	508	.....	508	Do.
Total.....	33,225	.....	33,225	
Rapid City:				
Custer.....	10,420	10,781	21,201	Mountainous, timbered, mineral, and grazing.
Fall River.....	12,120	.....	12,120	Broken, grazing land.
Lawrence.....	840	18,618	19,458	Mountainous, timbered.
Meade.....	11,026	.....	11,026	Broken, grazing lands.
Fennington.....	85,796	.....	85,796	Part bad lands, broken, grazing lands.
Total.....	120,202	29,399	149,601	
Timber Lake:				
Corson.....	7,292	.....	7,292	Grazing, broken, hilly.
Dewey.....	8,587	.....	8,587	Do.
Ziebach.....	24,351	.....	24,351	Do.
Total.....	40,230	.....	40,230	
State total.....	259,073	29,399	288,472	

* Also see Bismarck, N. Dak., report for remainder of Sioux County.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

UTAH.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Salt Lake City:				
Beaver.....	560,952	606,032	1,166,984	Generally arid: agricultural, mineral, grazing, and mountainous.
Box Elder.....	1,267,835	549,962	1,817,817	Do.
Cache.....	1,852	227,587	229,389	Do.
Carbon.....	470,999	22,578	493,577	Do.
Davis.....	26,350	.....	25,350	Do.
Duchesne.....	107,036	74,880	181,916	Do.
Emery.....	568,786	563,286	1,132,072	Do.
Garfield.....	588,950	1,841,128	2,440,078	Do.
Grand.....	694,443	1,077,300	1,771,743	Do.
Iron.....	1,006,942	15,984	1,021,926	Do.
Juab.....	799,795	972,240	1,772,035	Do.
Kane.....	840,842	1,432,455	2,273,297	Do.
Millard.....	1,160,856	2,106,847	3,267,703	Do.
Morgan.....	2,327	.....	2,327	Do.
Piute.....	104,423	78,795	183,218	Do.
Rich.....	237,067	.....	237,067	Do.
Salt Lake.....	1,537	29,313	30,855	Do.
San Juan.....	900,823	2,723,220	3,624,043	Do.
San Pete.....	354,808	15,397	370,205	Do.
Sevier.....	408,340	39,369	447,709	Do.
Summit.....	54,870	7,557	62,427	Do.
Tooele.....	1,349,959	1,955,361	3,305,320	Do.
Utah.....	27,053	358,350	385,403	Do.
Wasatch.....	18,357	1,250	19,607	Do.
Washington.....	476,722	49,435	526,157	Do.
Wayne.....	342,583	1,078,076	1,420,659	Do.
Weber.....	61,775	.....	61,775	Do.
Total.....	12,444,312	15,946,377	28,390,689	
Vernal:				
Daggett.....	134,755	.....	134,755	Agricultural, grazing, arid, mountainous, and minerals.
Duchesne.....	98,773	.....	98,773	Do.
Uintah.....	605,630	725,400	1,331,030	Do.
Wasatch.....	32,728	3,740	36,468	Do.
Total.....	871,886	729,140	1,601,026	
State total.....	13,316,198	16,675,517	29,991,715	

WASHINGTON.

Seattle:				
Clallam.....	780	.....	780	Burned-over mountain.
Jefferson.....	360	.....	360	Rough.
King.....	1,320	* 54,240	55,560	Rocky, mountainous.
Mason.....	440	.....	440	Do.
Pierce.....	.....	* 56,000	56,000	Mountainous.
San Juan.....	840	.....	840	Rough, rocky.
Skagit.....	1,400	1,800	3,200	Do.
Snohomish.....	.....	* 32,740	32,740	Rough.
Whatcom.....	1,520	1,000	2,520	Do.
Total.....	6,660	145,780	152,440	
Spokane:				
Adams.....	428	.....	428	Poor farming, desert.
Ferry.....	152,367	.....	152,367	Timber, mineral, grazing.
Lincoln.....	8,680	.....	8,680	Arid, poor farming, grazing.
Okanogan.....	27,240	.....	27,240	Grazing, farming, mineral.
Pend Oreille.....	40,120	.....	40,120	Mountainous, timbered.
Spokane.....	750	.....	750	Scab land, rough.
Stevens.....	119,930	7,300	127,230	Timbered, farming, grazing, and mineral.
Whitman.....	133	.....	133	Grazing, poor.
Total.....	349,648	7,300	356,948	

* Including 52,320 acres within odd-section grant to Northern Pacific Ry. Co.

* Within odd-section grant to Northern Pacific Ry. Co.

* Including 32,500 acres within odd-section grant to Northern Pacific Ry. Co.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

WASHINGTON—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Vancouver:				
Clarke.....	4,458	.....	4,458	In foothills, rough, some timber.
Cowlitz.....	5,810	.....	5,810	Do.
Klickitat.....	18,555	2,810	21,365	Rough, grazing, not much timber.
Lewis.....	4,745	62,449	67,194	Rough, some timber, grazing.
Pacific.....	129	.....	129	Rough.
Shamania.....	6,908	79,480	86,388	Mountainous, some timber.
Wahkiakum.....	818	.....	818	Rough and broken.
Total.....	40,980	144,679	185,659	
Walla Walla:				
Adams.....	8,467	.....	8,467	Grazing, desert, poor farming.
Asotin.....	14,595	.....	14,595	Mountainous, grazing, some farming.
Benton.....	33,321	.....	33,321	Grazing, desert.
Columbia.....	1,167	.....	1,167	Mountainous, grazing, some timber.
Franklin.....	34,956	.....	34,956	Grazing, desert.
Garfield.....	1,181	.....	1,181	Grazing, mountainous.
Klickitat.....	6,023	.....	6,023	Grazing, desert.
Walla Walla.....	2,112	.....	2,112	Grazing, some timber.
Whitman.....	1,759	.....	1,759	Grazing, some farming.
Total.....	103,581	.....	103,581	
Waterville:				
Chelan.....	15,506	4,356	19,861	Timber, grazing, and rough.
Douglas.....	15,321	.....	15,321	Grazing and rough.
Grant.....	15,052	.....	15,052	Sandy and grazing.
Kittitas.....	500	.....	500	Rough and grazing.
Okanogan.....	36,804	.....	36,804	Mountainous and grazing.
Total.....	83,182	4,356	87,538	
Yakima:				
Benton.....	69,200	.....	69,200	Semiarid, mountainous.
Grant.....	23,440	.....	23,440	Do.
Kittitas.....	59,160	.....	59,160	Semiarid, mountainous, timbered.
Yakima.....	48,720	.....	48,720	Do.
Total.....	200,520	.....	200,520	
State total.....	784,571	302,115	1,086,686	

WISCONSIN.

Waushara:				
Adams.....	217	.....	217	Sandy soil.
Ashland.....	203	.....	203	Sandy soil, mixed with loam.
Bayfield.....	919	.....	919	Farm land, somewhat sandy.
Buffalo.....	240	.....	240	Agricultural.
Burnett.....	255	.....	255	Fair agricultural.
Chippewa.....	85	.....	85	Broken.
Clark.....	240	.....	240	Grazing, agricultural.
Columbia.....	5	.....	5	Agricultural.
Crawford.....	16	.....	16	Agricultural, sandy.
Douglas.....	160	.....	160	Fair agricultural, some sandy.
Dunn.....	11	.....	11	Agricultural.
Eau Claire.....	80	.....	80	Fair agricultural.
Florence.....	40	.....	40	Rough, hardwood.
Forest.....	123	.....	123	Do.
Jackson.....	345	.....	345	Rolling, sandy loam.
Juneau.....	43	.....	43	Grazing, sandy.
La Crosse.....	82	.....	82	Sandy soil.
Marquette.....	459	.....	459	Fair agricultural.
Monroe.....	68	.....	68	Do.
Oconto.....	80	.....	80	Hardwood, with ledges of rock.
Oneida.....	506	.....	506	Rocky, soil sandy loam.
Pepin.....	40	.....	40	Agricultural.
Portage.....	51	.....	51	Sandy soil.
Price.....	361	.....	361	Sandy loam, hardwood.
Rusk.....	10	.....	10	Fair agricultural.

* Including 62,000 acres within odd-section grant to Northern Pacific Ry. Co.

* Within odd-section grant to Northern Pacific Ry. Co.

Statement showing the area of land unappropriated and unreserved on July 1, 1920—Con.

WISCONSIN—Continued.

Land district and county.	Area in acres.			Character.
	Surveyed.	Un-surveyed.	Total.	
Waushara—Continued.				
Sawyer.....	165	.....	165	Agricultural.
Taylor.....	80	.....	80	Broken, fair agricultural.
Trampealeau.....	80	.....	80	Farming.
Washburn.....	187	.....	187	Some clay, agricultural lands.
Wood.....	3	.....	3	Sandy.
State total.....	5,154	.....	5,154	

WYOMING.

Buffalo:				
Big Horn.....	883,720	45,120	928,840	Agricultural, grazing, mountainous.
Campbell.....	95,300	.....	95,300	Dry farming, grazing, and rolling.
Converse.....	1,000	.....	1,000	Grazing, hilly.
Fremont.....	1,880	.....	1,880	Grazing, mountainous, hilly, dry farming.
Hot Springs.....	106,900	.....	106,900	Grazing, mountainous.
Johnson.....	648,060	.....	648,060	Agriculture, dry farming, grazing, and mountainous.
Natrona.....	36,680	.....	36,680	Dry lands, rolling, grazing.
Sheridan.....	71,840	22,840	94,680	Agriculture, grazing, and dry farming.
Washakie.....	902,070	.....	902,070	Grazing, mountainous.
Total.....	2,747,450	67,960	2,815,410	
Cheyenne:				
Albany.....	353,841	21,581	375,422	Do.
Carbon.....	1,519,358	30,000	1,549,358	Grazing, mountainous, some timber.
Fremont.....	138,200	32,979	171,179	Mountainous, arid, timber.
Goshen.....	2,920	1,180	4,100	Broken, grazing, dry farming.
Laramie.....	10,530	.....	10,530	Prairie, grazing, dry farming.
Platte.....	35,180	.....	35,180	Do.
Sweetwater.....	562,360	.....	562,360	Mountainous, grazing, alkaline plains.
Total.....	2,622,389	85,740	2,708,129	
Douglas:				
Converse.....	97,878	30,130	128,008	Grazing.
Fremont.....	813,260	.....	813,260	Do.
Natrona.....	1,706,965	.....	1,706,965	Do.
Niobrara.....	154,742	.....	154,742	Do.
Total.....	2,772,835	30,130	2,802,965	
Evanston:				
Fremont.....	545,475	570,312	1,115,787	Farming, grazing, mountainous.
Lincoln.....	1,181,363	536,267	1,717,650	Farming, grazing, timber.
Sweetwater.....	3,620,166	172,398	3,792,559	Dry farming, grazing, alkaline.
Uinta.....	557,477	.....	557,477	Dry farming and grazing.
Total.....	5,904,481	1,278,992	7,183,473	
Lander:				
Big Horn.....	166,441	.....	166,441	Grazing, agriculture, mountainous, timber.
Fremont.....	1,863,174	41,577	1,904,751	Mountainous, arid, timber, farming, some stone.
Hot Springs.....	656,442	40,116	696,558	Farming, mineral, grazing, and timber.
Park.....	821,598	8,134	829,732	Timber, stone, farming, grazing, and some mineral.
Washakie.....	3,155	.....	3,155	Broken, farming, grazing.
Total.....	3,510,810	89,827	3,600,637	
Newcastle:				
Campbell.....	263,830	106,290	360,220	Broken, grazing.
Converse.....	8,520	.....	8,520	Prairie, grazing.
Crook.....	116,600	2,921	119,521	Seminomountainous lands, some timber.
Niobrara.....	5,760	.....	5,760	Broken, grazing lands.
Weston.....	74,960	.....	74,960	Small areas of timber, rolling, grazing.
Total.....	459,770	109,211	568,981	
State total.....	18,017,735	1,661,860	19,679,595	

Statement showing the area of land unappropriated and unreserved on July 1, 1920.

RECAPITULATION BY STATES.

State.	Area in acres.		
	Surveyed.	Unsurveyed.	Total.
Alabama.....	37, 200		37, 200
Arizona.....	6, 643, 609	11, 625, 400	18, 268, 909
Arkansas.....	276, 596		276, 596
California.....	15, 237, 248	4, 348, 583	19, 585, 831
Colorado.....	7, 364, 231	1, 576, 954	8, 941, 185
Florida.....	120, 077		120, 077
Idaho.....	5, 628, 945	3, 176, 167	8, 805, 112
Kansas.....	4, 346		4, 346
Louisiana.....	14, 240		14, 240
Michigan.....	73, 523		73, 523
Minnesota.....	256, 297		256, 297
Mississippi.....	33, 360		33, 360
Missouri.....	18		18
Montana.....	3, 964, 156	2, 009, 585	5, 973, 741
Nebraska.....	66, 844		66, 844
Nevada.....	31, 457, 972	22, 809, 203	54, 267, 175
New Mexico.....	14, 915, 870	3, 533, 008	18, 448, 878
North Dakota.....	81, 044		81, 044
Oklahoma.....	7, 404		7, 404
Oregon.....	13, 289, 365	747, 392	14, 036, 757
South Dakota.....	259, 073	29, 399	288, 472
Utah.....	13, 316, 198	16, 675, 517	29, 991, 715
Washington.....	784, 571	302, 115	1, 086, 686
Wisconsin.....	5, 154		5, 154
Wyoming.....	18, 017, 735	1, 661, 860	19, 679, 595
Grand total.....	131, 824, 975	68, 495, 153	200, 320, 128

The lands in the original 13 States, Connecticut, Delaware, Georgia, Maryland, Massachusetts, North Carolina, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, South Carolina, and Virginia, also in Texas, never formed a part of the public domain; their disposition is governed by the State laws, and information concerning same should be sought from the State authorities.

There are no public lands in the States of Kentucky and Tennessee and none is known to this office remaining undisposed of in the States of Illinois, Indiana, Iowa, and Ohio.

ALASKA.

The unappropriated lands in Alaska are not included herein. The total area of Alaska is 378,165,760 acres, of which about 25,384,000¹ acres are reserved. Approximately 1,264,449 acres have been surveyed under the rectangular system.

¹ 20,713,205 acres thereof are reserved for forestry purposes.

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DEPARTMENT OF THE INTERIOR

REPORT
OF THE
COMMISSIONER OF PENSIONS

TO THE
SECRETARY OF THE INTERIOR

FOR THE
FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

COMMISSIONERS OF PENSIONS SINCE 1833.

Name.	By whom appointed.	Whence appointed.	Date of commission.
Edwards, James L.....	Jackson.....	Virginia.....	Mar. 3, 1833
Heath, James E.....	Fillmore.....	.....do.....	Nov. 27, 1860
Waldo, Loren P.....	Pierce.....	Connecticut.....	Mar. 17, 1863
Minot, Josiah.....	.....do.....	New Hampshire.....	Aug. 1, 1865
Whiting, George C.....	.....do.....	Virginia.....	Jan. 19, 1867
Barrett, Joseph H.....	Lincoln.....	Ohio.....	Apr. 15, 1861
Cox, Christopher C.....	Johnson.....	Maryland.....	July 28, 1868
Van Aernam, Henry.....	Grant.....	New York.....	May 1, 1869
Baker, James H.....	.....do.....	Minnesota.....	Apr. 20, 1871
Atkinson, Henry M.....	.....do.....	Nebraska.....	Mar. 28, 1875
Gill, Charles R.....	.....do.....	Wisconsin.....	Feb. 10, 1876
Bentley, John A.....	.....do.....	.....do.....	Mar. 28, 1876
Dudley, William W.....	Garfield.....	Indiana.....	June 27, 1881
Clarke, Otis P. G.....	Arthur.....	Rhode Island.....	Nov. 15, 1884
Black, John C.....	Cleveland.....	Illinois.....	Mar. 19, 1885
Tanner, James.....	Harrison.....	New York.....	Mar. 27, 1889
Raum, Green B.....	.....do.....	Illinois.....	Oct. 19, 1889
Lochren, William.....	Cleveland.....	Minnesota.....	Apr. 13, 1893
Murphy, Dominic L.....	.....do.....	Pennsylvania.....	May 28, 1896
Evans, Henry Clay.....	McKinley.....	Tennessee.....	Apr. 1, 1897
Ware, Eugene F.....	Roosevelt.....	Kansas.....	May 10, 1902
Warner, Vespasian.....	.....do.....	Illinois.....	Mar. 4, 1905
Davenport, James L.....	Taft.....	New Hampshire.....	Nov. 26, 1909
Saltzgaber, Gaylord M.....	Wilson.....	Ohio.....	May 20, 1913

The Bureau of Pensions was organized as a bureau of the War Department under act of Mar. 2, 1833 (4 Stat. L., 622). It became a bureau of the Interior Department when that department was established by the act of Mar. 3, 1849 (9 Stat. L., 395).

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REPORT OF THE COMMISSIONER OF PENSIONS.

WASHINGTON, D. C., *August 2, 1920.*

SIR: I have the honor to submit my annual report of the operations of the Bureau of Pensions for the fiscal year beginning July 1, 1919, and ending June 30, 1920.

GENERAL.

Statistical and financial information, usually sought by committees and individuals of Congress and those of the public at large who feel an interest in the matters presented, is fully shown in the tables appended. Each exhibit tells its story of the varied activities of the Pension Bureau.

To save others the necessity of making a painstaking search of the tables to gain knowledge most frequently sought, I present below a statement of certain items concerning fiscal operations and important facts:

FISCAL OPERATIONS.

There were paid out the following amounts:

For pensions during the fiscal year:	
1919.....	\$222, 159, 292
1920.....	213, 295, 314
For fees and expenses of examining surgeons:	
1919.....	11, 228
1920.....	14, 870
For field and special examinations:	
1919.....	89, 982
1920.....	99, 953
To pensioners in foreign countries:	
1919.....	1, 188, 188
1920.....	1, 280, 581

For the last seven years the total cost for maintenance and expense of the pension system was as follows:

1914.....	\$2, 066, 507
1915.....	1, 779, 860
1916.....	1, 656, 722
1917.....	1, 562, 855
1918.....	1, 527, 615
1919.....	1, 433, 192
1920 (including beginning of retirement system).....	1, 395, 014

Number of employees:

1919.....	962
1920.....	904

INFORMATION OF GENERAL INTEREST.

	1919	1920
Pensioners on the roll June 30:		
Civil War—		
Soldiers.....	271,391	243,520
Widows.....	203,244	200,100
War with Spain—		
Soldiers.....	23,382	23,144
Widows.....	4,809	7,288
Indian wars—		
Survivors.....	3,436	3,745
Widows.....	2,027	2,483
Mexican War—		
Survivors.....	215	148
Widows.....	2,741	2,423
War of 1812, widows.....	81	71
By classes—		
Invalids.....	313,140	285,110
Widows.....	303,311	299,363
Dependents.....	4,689	4,422
Minors.....	2,241	2,272
Helpless children.....	917	913
Nurses.....	129	109
Total of all classes.....	624,427	592,190
Deaths of Civil War pensioners:		
Soldiers.....	27,703	27,871
Widows, minor children, etc.....	19,217	20,874
Largest number of Civil War soldiers on the roll was in 1898.....		745,822
Largest number of Civil War widows on the roll was in 1912.....		304,373
Total pieces of mail handled in 1920:		
Incoming.....		662,555
Outgoing.....		3,240,668
Amount of fees to attorneys, 1920.....		\$79,882
Income, refundments, etc.:		
For addresses, certified copies, etc. (act Aug. 24, 1912).....		\$6,860.62
Refundments to pension appropriations.....		10,929.47
Miscellaneous.....		1,345.86
Total.....		19,135.95
Amounts allowed as reimbursement for expenses of last sickness and burial in 1920.....		\$350,246
Total number entered on medal of honor roll (act Apr. 27, 1916).....		239

NEW LEGISLATION.

ACT OF MAY 1, 1920.

On May 1, 1920, there was approved "An act to revise and equalize rates of pension to certain soldiers, sailors, and marines of the Civil War and the War with Mexico, to certain widows, including widows of the War of 1812, former widows, dependent parents and children of such soldiers, sailors, and marines, and to certain Army nurses, and granting pensions and increase of pensions in certain cases."

Immediately upon the approval of this act, the following circular letter was prepared in the Pension Bureau, and many thousands were sent out for the purpose of giving information to all persons interested. This letter, in tabulated form, clearly and succinctly states the rates allowed:

To all persons interested:

Congress has passed an act known as the Fuller bill, which was approved by President Wilson May 1, 1920, and which then became a law, increasing pensions to the following persons:

War of 1812:

1. To widow of one who served in War of 1812..... \$30

War with Mexico:

2. To one who served 60 days or more and honorably discharged..... 50
3. To one who served 60 days or more, was honorably discharged, who is helpless or blind, or so nearly helpless or blind as to require regular personal aid and attendance..... 72
4. To widow of one who served 60 days or more and honorably discharged.. 30

Civil War:

5. To one who served 90 days or more in the Army, Navy, or Marine Corps of the United States and honorably discharged..... 50
6. To one who served less than 90 days, discharged for disability incurred in service in line of duty, in receipt of or entitled to pension, or on pension roll as a Civil War veteran..... 50
7. To one who served 90 days, honorably discharged, or having served less than 90 days, discharged for disability incurred in service in line of duty, or on the roll as a Civil War veteran, who is helpless or blind or so nearly helpless or blind as to require regular personal aid and attendance..... 72
8. To one who in service in line of duty lost—
 - (a) One hand or one foot or totally disabled in same..... 60
 - (b) An arm at or above elbow, or leg at or above knee, or totally disabled in same..... 65
 - (c) An arm at shoulder joint, leg at hip joint, or if artificial limb can not be used..... 72
 - (d) One hand and one foot, or totally disabled in same..... 90
9. To widow married prior to June 27, 1905—
 - (a) Of one who served 90 days or more and honorably discharged... 30
 - (b) Of one discharged for or died in service of a disability incurred in service in line of duty, regardless of length of service..... 30
 - (c) Married once or more than once after death of soldier or sailor husband if subsequent marriage has been dissolved by death or divorce without fault on her part..... 30

Civil War—Continued.

10. To widows above mentioned for each child under 16 years of age of officer or enlisted man, additional.....	\$6
11. To child or children under 16 years of age of such officer or enlisted man in case of death or remarriage of widow the whole pension.	
12. To Army nurses, Civil War.....	30
13. To dependent parents, Civil War.....	30

GENERAL INFORMATION.

The Pension Bureau will take steps promptly to make effective the provisions of the law.

No declaration will be required from those now on the roll and mentioned in foregoing clauses Nos. 1, 2, 4, 5, 6, 8, 9 (a), 10, 11, 12, and 13.

Declarations will be required in every case for original pension; also in claims under clauses 3, 7, 9 (b), and 9 (c).

Where declaration is required, pension, if allowed, will begin from the date of filing. Under clauses 3 and 7, pension, if allowed, will commence when the disability is shown to exist after approval of this act.

Where no declaration is required, increase of pension will commence from date of approval of said act.

Where a remarried widow filed an application under the act of September 8, 1916, pension, if allowed, will commence when her original application was filed. In all such cases the claimant should notify the Pension Bureau by letter or otherwise.

Claim agent or attorney not to be recognized except in claims for original pension, and in such cases not more than \$10 shall be paid for services, and only on order of the Commissioner of Pensions.

Declarations will be furnished on request.

Payments at the increased rates will be made at the date of the quarterly payment due July 4, August 4, and September 4, 1920, to those then entitled, and thereafter regularly. Earlier payment can not be made on account of necessary labor and changes.

GAYLORD M. SALTZOBER,
Commissioner of Pensions.

After the passage of the act of May 1, 1920, a section of experts was formed in the Pension Bureau to investigate and determine promptly where the increases could be granted to the pensioners already on the roll in cases not requiring new applications. The section was still in operation June 5, 1920, the date of the passage of the act pensioning soldiers and sailors of the War with Spain, the Philippine insurrection, and the China relief expedition, and claims coming within the purview of that act not requiring a declaration were also handled by this corps of experts. The work of these employees and of others throughout the bureau aiding them was expeditiously and well done. In less than five weeks they handled 47,939 cases.

ACT OF JUNE 5, 1920.

This was an act to pension soldiers and sailors of the War with Spain, Philippine insurrection, and the China relief expedition, and immediately upon its approval the Pension Bureau sent out the following circular letter prepared with a view to make plain the provisions of the act to those interested:

To whom it may concern:

By the terms of an act of Congress known as the Sells bill, approved by President Wilson June 5, 1920, all persons who served 90 days or more in the military or naval service of the United States during the War with Spain, the Philippine insurrection, and the China relief expedition, and who have been honorably discharged therefrom, and who are now or who may hereafter be suffering from any mental or physical disability of a permanent character, not the result of their own vicious habits, which so incapacitates them from the performance of manual labor as to render them unable to earn a support, may, on making due proof, be entitled to receive a pension, from date of filing application, not exceeding \$30 per month and not less than \$12 per month, proportioned to the degree of inability to earn a support.

It is also provided that pension may be granted to such persons on account of age and length of service at the following rates per month:

To one who has reached the age of—

62 years.....	\$12
68 years.....	18
72 years.....	24
75 years.....	30

It is also provided that all persons whose names are on the pension roll who while in the service of the United States in the Army, Navy, or Marine Corps and in the line of duty shall have suffered a specific disability may be entitled to pension per month as follows:

Loss of one hand or one foot or total disability of same.....	\$60
Loss of arm at or above elbow, or leg at or above knee, or total disability of same..	65
Loss of arm at shoulder joint, or leg at hip joint, or when an artificial limb can not be used.....	72
Loss of one hand and one foot or total disability of same.....	90
Loss of sight of both eyes.....	100

Agent or attorney for preparing and prosecuting a claim under said act allowed not more than \$20, payable only on order of the Commissioner of Pensions, and every person who shall withhold more shall be deemed guilty of a misdemeanor and fined or imprisoned.

Proper blanks will be furnished on request.

No application will be required for increase on account of specific disability.

GAYLORD M. SALTZGABER,
Commissioner of Pensions.

ACT OF MAY 22, 1920.

The act of May 22, 1920, was an act for the retirement of employees in the classified civil service, and for other purposes. This was a new departure in legislation. Although urged upon Congress by Government employees, no act had ever been passed giving annuities on account of age and service. Immediately upon its passage a letter of information was prepared in the Pension Bureau and furnished to those eligible for retirement. It briefly stated the provisions of the law, and is as follows:

LETTER OF INFORMATION.

The Sterling-Lahlbach bill for the retirement of employees in the classified civil service, and certain other employees, was approved by President Wilson May 22, 1920, when it became a law. Briefly stated, its provisions are as follows:

Generally, those who have reached the age of 70 years and rendered at least 15 years of service are eligible; mechanics, city and rural letter carriers, and post-office clerks are eligible at 65 years; railway postal clerks at 62 years of age.

The basis for annuity is length of service and a per centum of the average annual basic salary for the last 10 years of service. The classification and rates are as follows:

(a) Service, 30 years; annuity, 60 per cent of salary:	
Maximum.....	\$720
Minimum.....	360
(b) Service, 27 years; annuity, 54 per cent of salary:	
Maximum.....	648
Minimum.....	324
(c) Service, 24 years; annuity, 48 per cent of salary:	
Maximum.....	576
Minimum.....	288
(d) Service, 21 years; annuity, 42 per cent of salary:	
Maximum.....	504
Minimum.....	252
(e) Service, 18 years; annuity, 36 per cent of salary:	
Maximum.....	432
Minimum.....	216
(f) Service, 15 years; annuity, 30 per cent of salary:	
Maximum.....	360
Minimum.....	180

The term "basic salary" excludes "bonuses, allowances, overtime pay," etc.

Service is computed from date of original employment; includes periods of service at different times; includes service beyond seas; also in the Army, Navy, Marine Corps, or Coast Guard, but not if pension or compensation is allowed therefor.

Any employee to whom this act applies who shall have served for a total period of not less than 15 years, and who, before reaching the age of retirement, becomes totally disabled by reason of disease or injury not due to vicious habits, intemperance, or willful misconduct, may be retired.

No person may receive an annuity under this act and compensation under the act to provide compensation for employees suffering injuries covering the same period.

All employees to whom this act applies shall, upon the expiration of 90 days next succeeding its passage, if of retirement age, or thereafter on arriving at retirement age, be automatically separated from the service, and all salary or compensation shall cease from that date. The head of each department, branch, or office shall notify such employees 60 days in advance thereof.

If, within 60 days after the passage of this act, or not less than 30 days before the arrival of an employee at age of retirement, the head of the department, branch, or office in which employed certifies to the Civil Service Commission that by reason of efficiency and willingness to remain in the service, continuance would be advantageous to the public service, the employee may be retained for successive terms of 2 years upon certification. At the end of 10 years no employee shall be thus continued for more than 4 years.

Beginning the first day of the third month next after the passage of this act and monthly thereafter there shall be withheld $2\frac{1}{2}$ per cent from the basic salary of each employee.

The Secretary of the Treasury is authorized to supplement contributions of employees with donations, gifts, legacies, and bequests given for the benefit of civil service employees generally, or of any special class.

In cases of disability, if annuity is discontinued before the annuitant has received a sum equal to the total amount of contributions, with accrued interest, the difference shall be paid to the employee or estate.

On separation from service before reaching retiring age, the total amount of deductions of salary, with accrued interest at 4 per cent, compounded, shall, on application, be returned to the employee or to estate.

In case an annuitant shall die without having received in annuities an amount equal to the total amount deducted from his or her salary, with interest at 4 per cent, compounded, the excess of accumulated deductions shall be paid to legal representatives.

Annuities shall be paid monthly and are not assignable, or subject to execution or other legal process.

There are numerous other provisions for carrying the act into effect.

The Commissioner of Pensions, under the direction of the Secretary of the Interior, is to carry out this law.

Blank applications for annuity, as soon as prepared, will be furnished on request therefor.

GAYLORD M. SALTZGABER,
Commissioner of Pensions.

To carry into effect the provisions of the act of May 22, 1920, a division was promptly organized in the Pension Bureau. Regulations and rules of procedure were drafted, and approved by the Secretary of the Interior. Necessary blanks were prepared and sent out. The analogies between the operations under this act and those under pension legislation and practice are so numerous and so great that the Pension Bureau foresees no difficulty in promptly carrying out the purpose of this entirely new legislation.

SPECIAL ACTS OF CONGRESS.

During the year two omnibus bills to grant pensions by special acts of Congress were enacted into law. These acts granted pension to 733 individuals, 477 providing for original allowances, and 256 providing for increase of pension.

WITNESSES ON PENSION CHECKS.

The Secretary of the Interior, after a consultation with the Commissioner of Pensions and the disbursing clerk for the Bureau of Pensions, issued an order under date of June 24, 1920, that thereafter it would not be necessary to have two witnesses, or any witness, sign the indorsement on a pension check, except in cases where a pensioner signs by mark.

Four times a year pensioners were required when they indorsed a check to have two witnesses sign with them. As there are about 600,000 pensioners on the roll, it meant 2,400,000 signatures, and twice that many, or 4,800,000 names of witnesses. This meant an immense amount of trouble and annoyance to the pensioners and to bankers who cashed their checks.

For this gracious act on the part of Secretary Payne everybody who handles pension checks should be deeply grateful.

The same order applies to indorsements on checks that will be issued for the payment of annuities, refunds, and allowances. All checks now issued by the Pension Bureau will have the same simple form for the indorsement as others issued by the Treasury Department.

COMMENDATION FOR SPECIAL EXAMINATION DIVISION.

DEPARTMENT OF THE INTERIOR,

Washington, April 24, 1920.

DEAR MR. SALTZGABER: The auditor reports after having made a very careful audit and complete examination of my disbursement of the appropriation "Investigation of pension cases, Pension Office," fiscal year ended June 30, 1919, for the above period, no errors were found in any payment, and consequently no suspensions or disallowances were made against me.

This speaks well both for the accuracy and efficiency of your Special Examination Division and its well arranged method of administrative examination of all vouchers of the field force, prior to certification of their correctness and approval by you and payment by me. I am making this statement to you as evidence of my satisfaction and approval of the work in this direction, so well performed by your Special Examination Division. The division deserves the heartiest commendation in its efforts to protect the disbursing officer from any possible loss in the payment of an inaccurate account.

Cordially yours,

GEO. W. EVANS,
Chief Disbursing Clerk.

Operations of Special Examination Division for 5 years.

	1916	1917	1918	1919	1920
Appropriation.....	\$85,000.00	\$80,000.00	\$80,000.00	\$90,000.00	\$100,000.00
Expended.....	84,721.50	79,503.44	79,728.66	89,962.51	99,953.13
Unexpended balance.....	278.50	496.56	271.34	17.49	46.87
Average number of examiners...	49	51	49	46	49
Depositions taken.....	26,457	26,595	29,505	24,814	35,254
Depositions per examiner.....	538	543	605	738	719
Reports submitted.....	5,417	5,590	5,813	6,133	6,335
Reports per examiner.....	110	115	119	132	130
Cases disposed of.....	2,608	2,829	3,174	3,802	3,891
Cost per case.....	\$32.49	\$28.10	\$25.12	\$23.67	\$25.69

NUMBER OF DECLARATIONS FOR PENSION FILED UNDER THE ACTS OF MAY 1, 1920, AND JUNE 5, 1920.

Up to and including June 30, 1920, there were filed in the Pension Bureau 13,624 declarations under the act of May 1, 1920, and 9,002 declarations under the act of June 5, 1920.

FINALLY.

The employees of the Pension Bureau are worthy of praise for their extraordinary zeal and industry in promptly disposing of the great number of claims coming into the bureau under recently enacted legislation.

Respectfully submitted.

GAYLORD M. SALTZGABER,
Commissioner.

The SECRETARY OF THE INTERIOR.

EXHIBIT 1.—*Pensioners on the roll June 30, 1920, and June 30, 1919.*

Classes.	1920	1919	Gain.	Loss.
Regular Establishment:				
Invalids.....	14,477	14,655	.....	178
Widows.....	2,899	2,922	.....	23
Minor children.....	259	251	8	.....
Mothers.....	1,211	1,217	.....	6
Fathers.....	169	161	8	.....
Brothers, sisters, sons, and daughters.....	9	8	1	.....
Helpless children.....	7	4	3	.....
Civil War:				
Act Feb. 6, 1907—				
Survivors.....	410	579	.....	169
Act May 11, 1912—				
Survivors.....	234,756	200,127	.....	25,371
General law—				
Invalids.....	8,152	10,418	.....	2,266
Widows.....	39,346	42,773	.....	3,427
Minor children.....	62	86	.....	24
Mothers.....	129	189	.....	60
Fathers.....	11	17	.....	6
Brothers, sisters, sons, and daughters.....	635	683	.....	48
Helpless children.....	388	399	.....	11
Act June 27, 1890—				
Invalids.....	202	267	.....	65
Minor children.....	1,519	1,698	.....	179
Helpless children.....	512	507	5	.....
Act Apr. 19, 1908—				
Widows without children.....	245,170	247,940	.....	2,770
Widows with children.....	2,328	2,531	.....	203
Act Aug. 5, 1892—				
Nurses.....	109	129	.....	20
War with Spain:				
Invalids.....	23,144	23,382	.....	238
Widows.....	1,233	1,262	.....	29
Minor children.....	123	131	.....	8
Mothers.....	1,965	2,100	.....	135
Fathers.....	283	303	.....	20
Brothers, sisters, sons, and daughters.....	1	2	.....	1
Helpless children.....	5	6	.....	1
Act July 16, 1918—				
Widows.....	3,371	992	2,379	.....
Minors.....	306	72	234	.....
Helpless children.....	1	1	.....	.....
War of 1812:				
Widows.....	71	81	.....	10
War with Mexico:				
Survivors.....	148	215	.....	67
Widows.....	2,421	2,739	.....	318
Brothers, sisters, sons, and daughters.....	2	2	.....	.....
Indian wars:				
Survivors.....	3,745	3,436	309	.....
Widows.....	2,483	2,027	456	.....
World War:				
Invalids.....	76	61	15	.....
Widows.....	41	44	.....	3
Minor children.....	4	3	1	.....
Mothers.....	6	6	.....	.....
Fathers.....	1	1	.....	.....
Total	592,190	624,427	3,419	35,656
Net loss to the roll				32,237

EXHIBIT 2.—*Pensioners added to and dropped from the roll, the number on the roll at the beginning and at the close of the year, and the amount disbursed to each class of pensioners during the year ended June 30, 1930.*

Classes.	Number of pensioners beginning of year.	Gains to the roll.			Gains to classes by transfer from other classes.				Losses to the roll by—				Losses to classes.	Number of pensioners end of year.	Disbursements.
		Original.	Restoration.	Re-employment.	Original.	Restoration.	Re-employment.	Re-issuance.	Death.	Remarriage.	Limitation.	Fallure to claim.	Other causes.		
Regular Establishment:															
Army invalids.....	10,646	115	22	39	1			35	247			11	33	55	81,903,997.78
Army widows, etc.....	2,986	139						15	97	41	20	3	1	2,986	904,284.41
Navy invalids.....	4,009	40	13	43				3	111			7	20	1	719,476.50
Navy widows, etc.....	1,897	77	2	1					53	14	10			1,690	387,008.21
Civil War:															
Act Feb. 6, 1907—															
Army.....	550	2							79			3		393	86,281.01
Navy.....	20								8			1		17	6,862.76
Act May 11, 1912—															
Army.....	253,512	119	2	12	2	1		79	28,567			99	3	22	27,918
Navy.....	7,615	11						3	800			7		6,838	3,066,294.18
General law—															
Army invalids.....	10,250														
Army widows, etc.....	43,480	107	1	263				14	1,392	40	30	8	2	877	4,130,402.67
Navy invalids.....	657	3						5	3,794	19		16	7	21	39,966
Navy widows, etc.....														18	59,147.00
Act June 27, 1890—									63	2				906	188,171.28
Army invalids.....	248	3							31					149	31,673.48
Army minors, etc.....	2,132	179		14					11		263	17	8	58	402,377.20
Navy invalids.....	19								6					13	1,744.47
Navy minors, etc.....	73	3									9	3	1	62	10,545.64
Act Apr. 19, 1908—															
Army widows.....	241,651	13,604	6	421	75			4	16,401	418		64	37	4	238,844
Navy widows.....	8,520	443		12	1				616	5		2		8,054	74,831,416.37
Act Aug. 5, 1892—															
Army nurses.....	129								17					3	19,821.60
War with Spain:															
Army invalids.....	22,963	37	26	32					292			8	22	2	22,464
Army widows, etc.....	3,666	55		2					177	25	19	2	3	17	2,925,489.32
Navy invalids.....	209	2	1					1	10			2	1	3,409	731,853.69
Navy widows, etc.....									7	1				1	97,639.86
Act July 16, 1918—														201	48,444.94
Army widows, etc.....	1,043	2,655							22	93	23		3	1	3,556
Navy widows, etc.....	23	107							2	5				3,122	792,634.99
War of 1812:															
Widows.....	81								9					1	21,145.03

[illegible]

EXHIBIT 3.—*Pensioners and amounts paid, arranged by States, Territories, insular possessions, and foreign countries, during the fiscal year ended June 30, 1920.*

STATES AND TERRITORIES.			FOREIGN COUNTRIES.		
	Number.	Amount.		Number.	Amount.
Alabama.....	2,045	\$736,445.40	Azores.....	4	\$2,175.00
Alaska.....	44	15,845.29	Barbadoes.....	2	384.00
Arizona.....	652	235,158.36	Belgium.....	13	6,767.76
Arkansas.....	5,995	2,168,919.41	Bolivia.....	2	459.00
California.....	20,892	7,523,627.04	Brazil.....	6	1,251.00
Colorado.....	6,002	2,600,440.23	British West Indies.....	22	5,763.74
Connecticut.....	7,130	2,567,655.60	British Gulana.....	1	288.00
Delaware.....	1,427	513,891.24	Bulgaria.....	2	1,132.13
District of Columbia.....	6,470	2,329,976.39	Canada.....	1,842	663,451.56
Florida.....	3,654	1,315,878.47	Cape de Verde Islands.....	1	480.00
Georgia.....	2,079	748,680.48	Ceylon.....	1	300.00
Idaho.....	1,333	498,045.96	Chile.....	10	4,403.50
Illinois.....	41,981	15,119,968.31	China.....	17	3,690.94
Indiana.....	35,905	12,930,108.60	Colombia.....	4	745.40
Iowa.....	20,080	7,230,209.61	Comoro Islands.....	1	661.00
Kansas.....	23,632	8,510,355.83	Central America.....	11	3,843.00
Kentucky.....	15,546	5,568,065.40	Cuba.....	30	7,650.00
Louisiana.....	3,203	1,153,464.36	Czecho-Slovakia.....	11	7,552.59
Maine.....	10,297	3,708,155.65	Denmark.....	39	9,478.14
Maryland.....	8,566	3,084,787.92	Dutch West Indies.....	2	624.00
Massachusetts.....	24,695	8,893,163.40	East Africa.....	1	375.00
Michigan.....	24,884	8,954,023.69	Egypt.....	1	300.00
Minnesota.....	9,481	3,414,297.72	England.....	345	121,949.48
Mississippi.....	2,130	767,055.60	Estonia.....	1	736.13
Missouri.....	29,078	10,470,569.35	Fanning Islands.....	1	54.00
Montana.....	1,625	585,195.00	Finland.....	5	2,117.00
Nebraska.....	10,415	3,750,649.80	France.....	48	18,899.80
Nevada.....	246	88,580.53	Germany.....	178	159,794.87
New Hampshire.....	4,770	1,717,772.39	Greece.....	7	1,797.97
New Jersey.....	14,966	5,389,555.92	Haiti.....	2	450.00
New Mexico.....	1,369	493,004.27	Hongkong.....	2	366.00
New York.....	50,963	18,352,795.56	India.....	5	1,443.00
North Carolina.....	2,379	856,725.49	Ireland.....	294	81,664.14
North Dakota.....	1,892	681,347.04	Italy.....	50	13,883.60
Ohio.....	58,160	20,944,579.20	Japan.....	34	8,201.69
Oklahoma.....	7,963	2,867,635.57	Jugo-Slavia.....	1	983.60
Oregon.....	5,718	2,059,166.16	Liberia.....	4	1,332.00
Pennsylvania.....	55,924	20,139,350.87	Luxemburg.....	4	1,079.10
Rhode Island.....	3,061	1,102,327.32	Malta.....	1	180.00
South Carolina.....	1,132	407,655.84	Mauritius.....	1	108.00
South Dakota.....	3,781	1,361,613.71	Mexico.....	41	10,976.40
Tennessee.....	12,369	4,454,324.28	Morocco.....	1	75.00
Texas.....	5,600	2,016,672.00	Netherlands.....	8	3,876.00
Utah.....	741	266,848.92	Newfoundland.....	4	1,193.00
Vermont.....	4,673	1,682,840.77	New Zealand.....	12	4,614.00
Virginia.....	4,002	1,441,200.25	Norway.....	59	15,909.75
Washington.....	7,280	2,621,673.60	Panama.....	4	1,290.00
West Virginia.....	7,478	2,692,977.35	Peru.....	13	3,563.73
Wisconsin.....	14,251	5,132,084.38	Poland.....	3	2,830.13
Wyoming.....	549	197,705.89	Portugal.....	1	300.00
Total.....	588,538	211,943,068.42	Roumania.....	1	102.00
Canal Zone.....	12	4,321.44	Russia.....	10	.....
INSULAR POSSESSIONS.			Samoa.....	1	96.00
Guam.....	3	1,080.36	Scotland.....	45	12,830.80
Hawaii.....	65	23,407.80	Serbia.....	1	.....
Philippines.....	105	37,812.60	Seychelles Islands.....	1	.....
Porto Rico.....	13	4,681.56	South Africa.....	5	2,573.53
Virgin Islands.....	1	360.12	Spain.....	3	1,320.00
Total.....	187	67,342.44	St. Helena.....	1	360.00
FOREIGN COUNTRIES.			Society Islands.....	1	719.13
Algeria.....	1	300.00	Sweden.....	54	19,151.88
Argentina.....	8	2,925.00	Switzerland.....	47	14,493.33
Australia.....	83	27,273.93	Tasmania.....	2	1,020.00
Austria-Hungary.....	6	4,734.32	Tonga Islands.....	1	450.00
			Turkey in Asia.....	7	3,750.00
			Turkey in Europe.....	1	504.00
			Venezuela.....	1	120.00
			Wales.....	21	6,418.28
			Total.....	3,453	1,280,581.35

SUMMARY.

	Number.	Payments.
Pensioners residing in States and Territories and payments to them.....	588,538	\$211,943,068.42
Pensioners residing in Canal Zone and payments to them.....	12	4,321.44
Pensioners residing in insular possessions and payments to them.....	187	67,342.44
Pensioners residing in foreign countries and payments to them.....	3,453	1,280,581.35
Total.....	592,190	213,295,314.65

Statement showing loss to pension roll by death July 1, 1919, to June 30, 1920.

Months.	Invalids.		Widows, etc.		Total.
	Civil War.	Other classes.	Civil War.	Other classes.	
1919.					
July.....	1,906	75	1,318	44	3,343
August.....	1,942	90	1,532	88	3,652
September.....	1,925	91	1,425	44	3,485
October.....	1,882	69	1,367	46	3,364
November.....	2,081	64	1,446	80	3,671
December.....	1,856	89	1,510	65	3,511
1920.					
January.....	2,635	81	1,682	65	4,463
February.....	2,793	98	2,015	110	5,011
March.....	3,185	146	2,515	106	5,952
April.....	2,817	90	2,060	49	5,016
May.....	2,515	72	2,131	104	4,822
June.....	2,334	125	1,873	77	4,409
Total.....	27,571	1,076	20,874	878	50,599

EXHIBIT 4.—*Pensioners of the different wars on the roll at the close of each of the last 5 fiscal years.*

	1920	1919	1918	1917	1916
Civil War.....	533,729	568,843	591,793	618,326	654,007
War with Spain.....	30,432	28,261	27,513	28,275	28,472
War of 1812.....	71	81	99	109	115
War with Mexico.....	2,571	2,956	3,353	3,906	4,286
Indian wars.....	6,228	5,468	4,238	2,307	2,578
Regular Establishment.....	19,031	19,218	19,845	20,288	20,102
World War.....	128	115	56	.....	.....
Total.....	592,190	624,427	646,895	673,111	709,572

EXHIBIT 5.—*Comparative table of disbursements of pensions on account of the different wars for the last 5 fiscal years (cents omitted).*

	1920	1919	1918	1917	1916
Civil War.....	\$202,586,306	\$212,211,860	\$170,402,020	\$152,170,579	\$150,431,763
War with Spain.....	4,624,098	3,878,189	3,805,129	3,783,690	3,800,226
War of 1812.....	21,145	17,704	21,118	18,702	18,848
War with Mexico.....	676,682	758,156	833,854	842,055	808,281
Indian wars.....	1,746,808	1,561,537	989,916	413,997	475,072
Regular Establishment.....	3,604,038	3,701,782	3,776,049	3,666,041	3,626,910
World War.....	36,734	30,031	7,243	.....	.....
Total.....	213,295,811	222,159,289	179,835,329	160,895,054	159,155,090

EXHIBIT 6.—*Amount paid to pensioners, 1790 to 1920, inclusive.*

War of the Revolution.....	\$70,000,000.00
War of 1812.....	46,070,413.18
Indian wars.....	18,462,059.38
War with Mexico.....	53,582,977.63
Civil War.....	5,502,445,815.43
War with Spain and Philippine Insurrection.....	69,835,764.30
Regular Establishment.....	53,846,229.59
World War.....	74,010.03
Unclassified.....	16,508,447.41
Total.....	5,830,815,717.04

EXHIBIT 7.—Disbursements for pensions and for maintenance of pension systems, 1866 to 1920.

Fiscal year.	Paid as pensions.	Cost, maintenance, and expenses.	Total.	Number of pensioners.
1866.....	\$15,450,549.88	\$407,165.00	\$15,857,714.88	126,722
1867.....	20,784,780.69	490,977.35	21,275,757.04	155,474
1868.....	23,101,500.36	553,020.34	23,654,520.70	169,643
1869.....	28,513,247.27	584,526.81	29,077,774.08	187,963
1870.....	29,351,488.78	600,997.86	29,952,486.64	198,686
1871.....	28,518,792.62	863,079.00	29,381,871.62	207,495
1872.....	29,752,746.81	951,253.00	30,703,999.81	232,229
1873.....	26,982,063.89	1,008,200.64	27,990,264.53	238,411
1874.....	30,206,778.99	966,794.13	31,173,573.12	236,241
1875.....	29,270,404.76	982,695.35	30,253,100.11	224,821
1876.....	27,936,200.53	1,015,078.81	28,951,289.34	232,137
1877.....	28,182,821.72	1,034,459.33	29,217,281.05	232,104
1878.....	26,786,009.44	1,032,500.09	27,818,509.53	228,998
1879.....	33,664,428.92	837,734.14	34,502,163.06	242,755
1880.....	56,689,229.08	935,027.28	57,624,256.36	250,802
1881.....	50,583,406.85	1,072,069.64	51,655,466.49	268,830
1882.....	54,313,172.06	1,466,236.01	55,779,408.06	285,697
1883.....	60,427,573.81	2,591,648.29	63,019,222.10	308,668
1884.....	57,912,387.47	2,835,181.00	60,747,568.47	322,756
1885.....	65,171,937.12	3,392,576.34	68,564,513.46	345,125
1886.....	64,091,142.90	3,245,016.61	67,336,159.51	365,788
1887.....	73,752,997.08	3,753,400.91	77,506,397.99	406,007
1888.....	78,950,501.67	3,515,057.27	82,465,558.94	452,557
1889.....	88,842,720.58	3,466,968.40	92,309,688.98	489,725
1890.....	106,093,850.39	3,526,382.13	109,620,232.52	537,944
1891.....	117,312,090.50	4,700,636.44	122,013,326.94	676,160
1892.....	139,394,147.11	4,898,665.80	144,292,812.91	876,068
1893.....	156,906,637.94	4,867,734.42	161,774,372.36	966,012
1894.....	139,886,726.17	3,963,976.31	143,850,702.48	969,544
1895.....	139,812,294.30	4,338,020.21	144,150,314.51	970,524
1896.....	138,220,704.46	3,991,375.61	142,212,080.07	970,678
1897.....	139,949,717.35	3,987,783.07	143,937,500.42	976,014
1898.....	144,651,879.80	4,114,091.46	148,765,971.26	998,714
1899.....	138,355,062.95	4,147,517.73	142,502,570.68	991,519
1900.....	138,462,130.65	3,841,706.74	142,303,837.39	993,592
1901.....	138,531,483.84	3,868,795.44	142,400,279.28	997,735
1902.....	137,604,267.99	3,531,378.96	141,335,646.95	999,446
1903.....	137,759,653.71	3,993,216.79	141,752,870.50	996,545
1904.....	141,093,571.49	3,849,366.25	144,942,937.74	994,762
1905.....	141,142,861.33	3,721,832.82	144,864,694.15	998,441
1906.....	139,000,288.25	3,523,269.51	142,523,557.76	985,971
1907.....	138,155,412.46	3,309,110.44	141,464,522.90	967,371
1908.....	153,093,086.27	2,800,963.36	155,894,049.63	961,667
1909.....	161,973,703.77	2,852,583.73	164,826,287.50	946,194
1910.....	159,974,056.08	2,657,673.86	162,631,729.94	921,063
1911.....	157,325,160.35	2,517,127.06	159,842,287.41	892,098
1912.....	152,986,433.72	2,448,857.31	155,435,291.03	860,294
1913.....	174,171,660.80	2,543,246.59	176,714,907.39	820,200
1914.....	172,417,546.26	2,066,507.15	174,484,053.41	785,239
1915.....	165,518,266.14	1,779,880.30	167,298,146.44	748,147
1916.....	159,155,069.92	1,656,722.33	160,811,812.25	709,572
1917.....	160,895,053.94	1,562,854.96	162,457,908.90	673,111
1918.....	179,835,328.75	1,527,615.61	181,362,944.36	646,895
1919.....	222,159,292.70	1,433,191.67	223,592,484.37	624,427
1920.....	213,295,314.65	1,395,014.09	214,690,328.74	592,190
Total.....	5,734,370,272.81	137,293,731.75	5,871,664,004.56	.....

EXHIBIT 8.—Appropriations for pensions and disbursements on account thereof for the fiscal year ended June 30, 1920, and unexpended balances at close of year.

	Pensions.			Fees of examining surgeons, pensions.
	Army.	Navy.	Total.	
Appropriations:				
Act of Feb. 25, 1919.....	\$207,500,000.00	\$7,500,000.00	\$215,000,000.00	\$30,000.00
Repayments to the appropriations....	112,349.36	3,127.30	115,476.66	.....
Total to be accounted for.....	207,612,349.36	7,503,127.30	215,115,476.66	30,000.00
Disbursements:				
Amount disbursed by disbursing clerk, Bureau of Pensions.....	206,951,825.95	7,343,488.70	213,295,314.65	.....
Amount disbursed by chief disbursing clerk, Department of the Interior.....	.....	.....	.....	14,870.70
Total amount disbursed.....	206,951,825.95	7,343,488.70	213,295,314.65	14,870.70

EXHIBIT 8.—Appropriations for pensions and disbursements on account thereof for the fiscal year ended June 30, 1920, and unexpended balances at close of year—Continued.

	Pensions.			Fees of examining surgeons, pensions.
	Army.	Navy.	Total.	
Balances June 30, 1920:				
Remaining in the hands of disbursing clerk, Bureau of Pensions.....	\$1,060,523.41	\$84,648.60	\$1,145,172.01	.....
Remaining in the hands of chief disbursing clerk, Department of the Interior.....				\$3,129.30
Remaining in the United States Treasury.....	600,000.00	75,000.00	675,000.00	12,000.00
Available balance.....	1,660,523.41	159,648.60	1,820,172.01	15,129.30
Total accounted for.....	207,612,349.36	7,508,137.30	215,115,486.66	30,000.00

In addition to the above there were disbursed during the fiscal year ended June 30, 1920, the following sums chargeable to the appropriation for the fiscal year ended June 30, 1919:

Fees of examining surgeons, pensions, by chief disbursing clerk, Department of the Interior..... \$5,042.10
 Fees of examining surgeons, pensions, by Treasury settlements..... 72.00

Total..... 5,114.10

Of the amount \$7,343,483.70 disbursed for Navy pensions, \$300,386.19 was paid from the Navy pension fund.

EXHIBIT 9.—*Number of inmates of the United States Soldiers' Home, St. Elizabeths Hospital, and the various branches of the National Home for Disabled Volunteer Soldiers, and the amount paid such inmates from July 1, 1919, to June 30, 1920.*

Institution and location.	July 1 to Sept. 30, 1919.		Oct. 1 to Dec. 31, 1919.		Jan. 1 to Mar. 31, 1920.		Apr. 1 to June 30, 1920.		Total.
	Number.	Amount.	Number.	Amount.	Number.	Amount.	Number.	Amount.	
Battle Mountain Sanitarium, Hot Springs, S. Dak.	328	\$33,390.56	320	\$32,087.66	357	\$35,354.94	360	\$35,388.19	\$136,199.35
Central Branch, National Military Home, Ohio	2,556	253,612.53	2,540	250,953.70	2,472	244,181.77	2,160	214,992.01	963,039.51
Danville Branch, National Military Home, Ill.	1,441	141,333.61	1,384	136,763.08	1,398	133,640.75	1,244	121,257.78	539,296.90
Eastern Branch, National Soldiers' Home, Mo.	1,041	103,631.01	912	91,379.15	1,008	97,558.41	703	80,086.08	335,546.51
Merion Branch, National Military Home, Ind.	1,161	114,801.30	1,166	111,109.21	1,169	114,814.73	1,078	108,482.06	452,007.70
Mountain Branch, National Soldiers' Home, Tenn.	1,627	148,166.83	1,603	153,581.24	1,602	155,132.43	1,149	112,461.35	572,341.85
Northwestern Branch, National Home, Wis.	1,014	98,593.07	938	92,372.76	1,003	98,073.65	831	84,014.77	384,026.55
Pacific Branch Soldiers' Home, Calif.	2,773	266,883.38	2,814	285,797.03	2,927	285,983.66	2,720	276,691.77	1,148,865.84
St. Elizabeths Hospital, Washington, D. C.	186	14,101.34	192	14,800.16	195	20,477.90	180	13,148.50	62,527.90
Southern Branch, National Soldiers' Home, Va.	814	57,961.20	821	59,327.30	803	57,484.57	642	66,140.54	261,402.51
United States Soldiers' Home, Washington, D. C.	2,042	206,671.78	2,088	209,423.34	2,133	215,862.41	1,960	199,094.95	830,023.51
Western Branch, National Military Home, Kans.	14,786	1,450,876.60	14,776	1,445,886.53	14,785	1,449,606.02	13,923	1,371,908.19	5,718,287.34
Total									

¹ Resumed payment May 6, 1920.

Total amount of attorney fees paid in cases where the pensioners were inmates of the above-named homes during the fiscal year ended June 30, 1920, was \$352, making the entire disbursement on account of homes, \$5,718,639.34.

Number of admissions, discharges, and transfers to and from the various branches of the National Military Home, during the fiscal year ended June 30, 1920, 9,444.

EXHIBIT 10.—*Certificates issued during the fiscal year ended June 30, 1920.*

Classes.	Original.	Increase.	Re-issue.	Restoration.	Renewal.	Supplemental.	Total.
General law:							
Civil War, Army—							
Invalids.....		37	5		20		62
Nurses.....			1				1
Widows, etc.....	101	2	13	3	2		121
Civil War, Navy—							
Invalids.....							
Widows, etc.....	3						3
War with Spain, Army—							
Invalids.....	36	235	13	27	34		345
Widows, etc.....	53				2		55
War with Spain, Navy—							
Invalids.....	2	6	1	1			10
Widows, etc.....	2		1				3
Regular Establishment, Army—							
Invalids.....	113	162	25	23	38		361
Widows, etc.....	144		3	1	3		151
Regular Establishment, Navy—							
Invalids.....	42	65	7	22	71	1	208
Widows, etc.....	74			2	1		77
World War, Army—							
Invalids.....	8						8
Widows, etc.....	11						11
World War, Navy—							
Invalids.....	10	1	1				12
Widows, etc.....	2						2
Act of June 27, 1890:							
Civil War, Army—							
Invalids.....	5	2	2	2		5	16
Widows, etc.....	196		6	3	17	3	225
Civil War, Navy—							
Invalids.....							
Widows, etc.....	4						4
Act of Feb. 6, 1907:							
Civil War, Army, soldiers.....	3		7			1	11
Civil War, Navy, sailors.....	1						1
Mexican War, survivors.....							
Act of Apr. 19, 1908:							
Civil War, Army, widows.....	161	9	9	2	3		184
Civil War, Navy, widows.....	3	1					4
Act of May 11, 1912:							
Civil War, Army, soldiers.....	123	383	942	8	141		1,597
Civil War, Navy, sailors.....	12	4	24		3		43
Mexican War, survivors.....		2					2
Act of Apr. 19, 1908, amended by act of Sept. 8, 1916:							
Civil War, Army, widows.....	13,090	1	4	1	4		13,100
Civil War, Navy, widows.....	428						428
Act of Sept. 8, 1916, sec. 2:							
Civil War, Army, former widows.....	508		2		697		1,202
Civil War, Navy, former widows.....	17				13		30
Act of Jan. 29, 1887, etc.:							
Mexican War—							
Survivors.....							
Widows.....	25	86					111
Act of July 27, 1892, etc.:							
Indian wars—							
Survivors.....	3						3
Widows.....	39						39
Act of Mar. 4, 1917:							
Indian wars—							
Survivors.....	655						655
Widows.....	609						609
War of 1812, widows.....		18					18
Act of July 16, 1918:							
Army, widows.....	2,652		5			1	2,658
Navy, widows.....	107						107
Act of May 1, 1920:							
Civil War, Army—							
Soldiers.....	3	5					8
Widows.....	31		1		5		37
Civil War, Navy—							
Sailors.....	1						1
Widows.....							
Civil War, Army, former widows.....							
Civil War, Navy, former widows.....							
Mexican War, widows.....							
Act of June 5, 1920:							
Army, soldiers.....			1				1
Navy, sailors.....							
Total.	19,272	1,019	1,073	96	1,054	11	22,524
Reissues in lieu of lost certificates.....							1,249
Accrued pension orders.....							14,864
Grand total.							38,637

Pension certificates for reimbursement, 53.

1 Concurrent originals, 4.

EXHIBIT 11.—Statement showing by classes the different monthly rates paid to pensioners under the general pension laws and the number at each rate on the roll June 30, 1920.

Rate.	Civil War.										War with Spain.		War with Mexico.		Indian wars.		World War.	
	Act May 11, 1912.	Act Feb. 6, 1907.	General law.		Act June 27, 1890.		Act Apr. 19, 1908.		Nurses.	War of 1812, wid-ows.	Surviv-ors.	Widows, etc.	Surviv-ors.	Widows.	Surviv-ors.	Widows.	Surviv-ors.	Wid-ows, etc.
			Invalids.	Widows, etc.	Invalids.	Minors, etc.	Widows.	Widows.										
\$2.00			144	1	19							4						1
6.00												8,718					12	
6.25												5						
7.50			3									27						
8.00			68	1	38							3,890					9	
8.50												32						
10.00			74		25							2,593					6	
11.25												24						
12.00		259	136	678	120	2,030		79		8		5,951		340		2,378	16	27
12.50			1									10						
13.75			1					35										
13.00																		
13.50	3																	
14.00	1		66		1			864										
15.00		54	6	11				71				5					2	2
15.50	3																	
16.00			13															
16.50	1																	
17.00			222	27				27										
18.00	1							1,559				12					10	2
18.75			1					2										
20.00	1	96	26	528				104		56			3	1,735	3,702	6		1
21.25								3										
22.00			27					62										
22.50	4							4										
24.00	1		369					562										
25.00			38					23										
27.00			34	35,240			247,498	19				1,032	1	224		44	1	12
27.50								1										
28.00			1					1										
28.18								1										
31,534			923	154				363				16		4	14		4	7
31.68	1																	
44,170																		
32.18																		
33.50	2																	
33.75	1							1										

EXHIBIT 12.—*Total number of certificates issued on account of all claims allowed since the establishment of the pension system (to include June 30, 1920).*

Original soldiers' and sailors' claims allowed:		
Revolutionary War.....	82,504	
War of 1812.....	25,723	
Mexican War.....	20,668	
Indian wars.....	10,467	
Old wars, prior to Mar. 4, 1861.....	9,486	
Army, since Mar. 4, 1861 (exclusive of War with Spain).....	1,187,135	
Navy, since Mar. 4, 1861 (exclusive of War with Spain).....	44,964	
War with Spain—		
Army.....	31,008	
Navy.....	1,099	
Total.....	32,107	
Total.....	1,333,054	
Reissue and increase claims allowed:		
Revolutionary War.....	2,962	
Mexican War (approximated).....	20,699	
Indian wars (approximated).....	665	
Army (approximated and exclusive of War with Spain).....	3,667,428	
Navy (approximated and exclusive of War with Spain).....	132,338	
War with Spain—		
Army.....	16,116	
Navy.....	447	
Total.....	16,563	
Total.....	3,840,685	
Total soldiers' and sailors' claims allowed.....	5,173,739	
Original widows' claims allowed:		
Revolutionary War widows.....	22,644	
Revolutionary War daughters (special acts).....	18	
War of 1812.....	35,520	
Mexican War.....	16,299	
Indian wars.....	9,634	
Old wars, prior to Mar. 4, 1861.....	8,042	
Army, since Mar. 4, 1861 (exclusive of War with Spain).....	874,294	
Navy, since Mar. 4, 1861 (exclusive of War with Spain).....	27,826	
War with Spain—		
Army.....	8,863	
Navy.....	457	
Total.....	9,320	
Total.....	1,003,597	
Reissue and increase claims allowed:		
War with Spain (Army, 245; Navy, 28).....	273	
All other acts (approximated).....	71,955	
Total.....	72,228	
Total widows' claims allowed.....	1,075,825	
Approximated number of issues on account of all claims allowed:		
Soldiers and sailors.....	5,173,739	
Widows.....	1,075,825	
Total.....	6,249,564	

EXHIBIT 13.—*Number of pensions granted by special acts each Congress since Mar. 4, 1861.*

Thirty-seventh (1861-1863).....	12	Fifty-third (1893-1895).....	119
Thirty-eighth (1863-1865).....	27	Fifty-fourth (1895-1897).....	378
Thirty-ninth (1865-1867).....	138	Fifty-fifth (1897-1899).....	694
Fortieth (1867-1869).....	275	Fifty-sixth (1899-1901).....	1,391
Forty-first (1869-1871).....	85	Fifty-seventh (1901-1903).....	2,171
Forty-second (1871-1873).....	167	Fifty-eighth (1903-1905).....	3,535
Forty-third (1873-1875).....	182	Fifty-ninth (1905-1907).....	6,080
Forty-fourth (1875-1877).....	98	Sixtieth (1907-1909).....	6,600
Forty-fifth (1877-1879).....	280	Sixty-first (1909-1911).....	9,649
Forty-sixth (1879-1881).....	96	Sixty-second (1911-1913).....	6,350
Forty-seventh (1881-1883).....	216	Sixty-third (1913-1915).....	5,061
Forty-eighth (1883-1885).....	598	Sixty-fourth (1915-1917).....	5,885
Forty-ninth (1885-1887).....	856	Sixty-fifth (1917-1919).....	3,641
Fiftieth (1887-1889).....	1,015	Sixty-sixth (1919 to June 30, 1920).....	733
Fifty-first (1889-1891).....	1,388		
Fifty-second (1891-1893).....	217	Total.....	57,657

EXHIBIT 14.—*Pension claims pending June 30, 1920.*

Act of May 1, 1920.....	12,053
Act of June 5, 1920.....	958
Other acts.....	25,935
Total.....	38,946
Act of Mar. 3, 1899 (deserted wives).....	42
Act of Mar. 2, 1895:	
Accrued.....	12,111
Reimbursement.....	1,438
Cases before Board of Pension Appeals.....	116
Cases awaiting special examination.....	1,207

DEPARTMENT OF THE INTERIOR

R E P O R T
OF THE
COMMISSIONER OF PATENTS
TO THE
SECRETARY OF THE INTERIOR
FOR THE
FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.

DEPARTMENT OF THE INTERIOR,
UNITED STATES PATENT OFFICE,
Washington, D. C., August 13, 1920.

SIR: I have the honor to submit herewith the following report of the business of the United States Patent Office for the fiscal year ended June 30, 1920:

Applications received during fiscal year ended June 30, 1920.

Applications for patents for inventions.....	81,948
Applications for patents for designs.....	4,110
Applications for reissues of patents.....	322
Applications for registration of trade-marks.....	14,710
Applications for registration of labels.....	1,280
Applications for registration of prints.....	570
Total applications.....	102,940
Disclaimers.....	24
Appeals on the merits.....	1,966
Notices of opposition.....	388

Total applications, disclaimers, appeals, and notices of opposition.... 105,318

Applications for patents for inventions.

Year ended June 30—		Year ended June 30—	
1911.....	65,365	1916.....	67,348
1912.....	69,236	1917.....	68,690
1913.....	67,986	1918.....	62,399
1914.....	69,311	1919.....	62,755
1915.....	66,497	1920.....	81,948

Applications for patents, including reissues and designs, and applications for the registration of trade-marks, labels, and prints.

Year ended June 30—		Year ended June 30—	
1911.....	74,677	1916.....	80,621
1912.....	79,747	1917.....	81,538
1913.....	78,411	1918.....	73,307
1914.....	81,539	1919.....	75,657
1915.....	79,118	1920.....	102,940

Applications awaiting action.

June 30—		June 30—	
1914.....	22,283	1918.....	14,769
1915.....	18,270	1919.....	17,735
1916.....	16,559	1920.....	34,355
1917.....	16,058		

Patents withheld and patents expired.

	1919	1920
Letters patent withheld for nonpayment of final fees.....	8,354	7,235
Applications allowed awaiting payment of final fees.....	15,210	16,333
Patents expired.....	26,080	29,329
Applications in which issue of patents has been deferred under section 4885, Revised Statutes.....	848	171
Applications in process of issue.....	3,527	2,653

Patents granted and trade-marks, labels, and prints registered.

Class.	1916	1917	1918	1919	1920
Letters patent.....	44,153	42,328	39,214	37,259	37,316
Design patents.....	1,761	1,686	1,146	1,355	2,102
Reissue patents.....	217	165	166	205	227
Trade-marks.....	6,109	6,126	4,844	3,766	6,984
Labels.....	833	781	516	572	622
Prints.....	402	342	192	196	158
Total.....	53,477	51,428	46,078	43,353	47,409

Receipts from all sources, fiscal year ended June 30, 1920.

Applications, first fees.....	\$1,226,650.84
Designs.....	62,760.00
Reissues.....	9,635.00
Trade-marks.....	147,105.55
Final fees.....	728,362.50
Appeals and oppositions.....	26,245.00
Disclaimers.....	240.00
Coupons.....	101,526.66
Drawings.....	5,478.35
Recording assignments.....	32,435.30
Labels.....	7,404.30
Prints.....	3,024.00
Copies of records.....	244,829.83
Official Gazette and other publications through Government Printing Office (estimated).....	20,000.00
Total.....	2,615,697.33

Expenditures, fiscal year ended June 30, 1920.

Salaries.....	\$1,421,129.68
Scientific library.....	2,405.63
Postage on foreign mail.....	1,107.00
Stationery.....	11,420.14
Furniture and sundries.....	10,168.93
Ice.....	269.85
Washing towels.....	137.90
Telephones.....	659.98
Telegraphing.....	21.17
Investigating public use.....	407.02
Photolithographing:	
Current issue.....	49,862.94
Reproductions.....	98,247.21
Foreign patents.....	1,969.92
Transportation of foreign exchange copies.....	690.55
Photographic printing.....	6,002.58
Photostat supplies.....	11,582.79
Dry mounts.....	6,643.00

Printing and binding:	
Official Gazette.....	\$131,421.95
Indexes.....	9,882.71
Specifications.....	408,690.69
Miscellaneous.....	29,155.60
International Convention for Protection of Industrial Property (estimated).....	750.00
Coal.....	19,378.20
Fixed charges not enumerated.....	122.77
Total.....	2,222,128.21
Increase in compensation.....	- 214,433.16
Grand total.....	2,436,561.37

Receipts and expenditures.

Receipts from all sources.....	\$2,615,697.33
Expenditures.....	2,436,561.37
Net surplus.....	179,135.96
Total net surplus to date.....	8,305,023.56

Comparative statement.

June 30—	Receipts.	Expenditures.	Surplus.
1911.....	\$1,987,778.58	\$1,957,001.85	\$30,776.73
1912.....	2,094,056.50	2,019,236.01	74,820.49
1913.....	2,082,490.23	1,824,459.42	158,030.81
1914.....	2,169,888.95	1,829,182.52	240,706.43
1915.....	2,270,937.68	2,087,581.26	183,356.42
1916.....	2,394,030.48	2,051,656.79	232,373.69
1917.....	2,817,519.72	2,096,138.68	222,381.04
1918.....	2,103,660.56	2,181,616.18	-27,955.62
1919.....	2,113,850.17	2,178,678.80	-65,228.13
1920.....	2,615,697.33	2,436,561.37	179,135.96

Appellate work.

Interferences declared.....	1,443
Interferences disposed of before final hearing.....	939
Interferences heard.....	287
Interferences disposed of.....	303
Interferences awaiting decision.....	34

Oldest case awaiting action, Apr. 2, 1920.

Appeals to examiners in chief in interference cases.....	218
Ex parte appeals to examiners in chief.....	1,263
Total.....	1,481

Appeals in interference cases disposed of.....	208
Ex parte appeals disposed of.....	1,127
Total.....	1,335

Interference cases awaiting action.....	102
Ex parte cases awaiting action.....	536
Total.....	638

Oldest interference case awaiting action, Dec. 4, 1919.

Oldest ex parte case awaiting action, Apr. 5, 1920.

Appeals to commissioner in interference cases.....	138
Appeals to commissioner in opposition cases.....	13
Appeals to commissioner in cancellations.....	4
Ex parte appeals to commissioner.....	173
Interlocutory appeals to commissioner.....	132
Ex parte appeals in trade-mark cases.....	79
Total.....	539
Petitions to commissioner.....	3, 240
Total.....	3, 779
Cases disposed of by commissioner:	
Appeals in interference cases.....	143
Appeals in opposition cases.....	14
Appeals in cancellation cases.....	9
Ex parte appeals.....	183
Interlocutory appeals.....	126
Ex parte appeals in trade-mark cases.....	63
Total.....	538
Petitions to commissioner.....	3, 295
Total.....	3, 833
Appeals to Court of Appeals, District of Columbia:	
Ex parte cases.....	17
Interference cases.....	69
Opposition cases.....	8
Cancellation cases.....	2
Total.....	96

During the year 86,380 applications for patents, including reissues and designs, and 147,739 amendments in pending cases were filed. The number of letters constituting the miscellaneous correspondence received and indexed was 304,646.

The number of printed copies of specifications of patents sold was 2,522,218, for which a revenue of \$196,698.15 was received by the Office, this amount being an increase of \$89,545.30 over the receipts of last year. A total of 999,862 copies of patents was shipped to foreign Governments. The whole number of copies of patents furnished for sale for governmental use and for foreign Governments was 3,896,297.

The Office received for record 40,188 deeds of assignment, containing on an average 466.77 words per deed. There were also recorded, without fees, for other departments 4,592 deeds.

Typewritten copies of 29,865,100 words and photostatic copies of 19,201,400 words of records aggregating 49,066,500 words were furnished at 10 cents per hundred words, for which the Office received \$49,066.50; and for certifying to these copies \$2,499.25 additional, making a total of \$51,565.75. For 13,519 certified printed copies, etc., the Office received \$11,236.20. For 122,367 photostatic copies of foreign patents, etc., the Office received \$24,050.65, and for 75,324 photographic copies \$11,862.30. For all of this class of work the Office received a total of \$98,714.90. The Office furnished to other departments, without charge, 647 photostatic copies, and made for its own use 86,835 copies; 10,708 photographic copies were made for its own use.

RÉSUMÉ.

Special attention is called to the unusual increase in the business of this Office in all its branches for the fiscal year just closed. The gains over the previous fiscal year in applications for mechanical patents, registration of trade-marks, and in total applications were, respectively, 19,193, 6,149, and 27,283 in numbers and 30, 72, and 36 per cent in proportionate increases. The gain in actual numbers far exceeded any previous increase of business in any one fiscal year, and this gain is larger than the *total* receipts of any calendar year in the history of the Office up to and including the year 1881.

The gain in business in the number of printed copies of patents sold was 22 per cent; in deeds of assignment received for record, 34 per cent; and in words furnished of copies of records, 79 per cent.

The receipts of money for copies of patents increased 84 per cent. It is to be noted that the increase of price of these copies from 5 cents to 10 cents, required by the first deficiency appropriation act of November 4, 1919, was effective for a little more than half the year. The gain in receipts of money if increase of price had been effective the whole year would have amounted to 140 per cent.

The total receipts of money increased 23.8 per cent, and the net deficit for the fiscal year 1919 of \$65,228.13 was turned into a net surplus of \$179,135.96, making a relative net increase of \$244,364.09 for the year.

Respectfully submitted.

R. F. WHITEHEAD,
Commissioner of Patents.

The SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR

STATEMENT OF THE
COMMISSIONER OF EDUCATION

TO THE

SECRETARY OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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STATEMENT OF THE COMMISSIONER OF EDUCATION.

DEPARTMENT OF THE INTERIOR,
BUREAU OF EDUCATION,
Washington, D. C., September 1, 1920.

SIR: I have the honor to submit the following statement of the operations of this office for the fiscal year ended June 30, 1920, together with recommendations for the extension and improvement of this work.

FUNCTIONS OF THE BUREAU.

The act which established the Bureau of Education provides that it is "for the purpose of collecting such statistics and facts as shall show the condition and progress of education in the several States and Territories, and of diffusing such information respecting the organization and management of schools and school systems and methods of teaching as shall aid the people of the United States in the establishment and maintenance of efficient school systems and otherwise promote the cause of education throughout the country."

The bureau has no direct administrative duties except those involved in the education, support, and medical relief of the natives of Alaska, and in approving expenditures of funds appropriated by the Federal Government for the colleges of agriculture and mechanic arts which receive aid from the Federal Government. As far as the moneys appropriated to it by the Congress will permit, the bureau attempts to carry out the spirit of the act quoted and to function as an agency of information, of advice, of research, of organization, of opinion, and of propaganda.

In the report of the Commissioner of Education to the Secretary of the Interior for the year ended June 30, 1915, five lines of work which the bureau was then carrying on were set forth. Briefly, these were to gather and disseminate accurate and comprehensive educational data, to serve as a clearing house for the best opinion on educational matters, to advise with persons interested in education, to promote desirable educational tendencies, and to conduct and direct experiments in education. Except for some interruption during the war period, the plans announced at that time have been steadily followed. They will be here repeated more fully to serve as a background upon which to show the efforts of the bureau for the past fiscal year.

Section I.

A CLEARING HOUSE FOR EDUCATIONAL INFORMATION.

The bureau attempts, first, "to serve as a clearing house for accurate and comprehensive information in respect to all educational agencies and all forms of education in the United States and all foreign countries, and to disseminate this information among school officers, teachers, students of education, and all others directly interested in any form of educational activity." In attaining this end the bureau does by far the larger and more important part of its work in the regular routine of daily duties at the offices in Washington. By means of letters of inquiry, questionnaires, personal interviews, voluntary reports from school officials and others, and studies of original documents it gathers facts and makes the information thus gained available to the public in the form of pamphlets, bulletins, circulars, and letters to individuals and to the press.

CORRESPONDENCE.

During the year there were received at the Washington office alone 166,746 letters, 45,828 library publications, and 58,287 forms of various kinds. This does not take into account any of the mail matter received at the various research stations and by special agents and at bureau offices other than those in the Pension Building. This is a decrease from the figures of the year 1918-19, an unusually active year because of war conditions. It is more than eight times the volume of the bureau's correspondence in 1910.

PUBLICATIONS.

Although the increased cost of printing caused its appropriation for that purpose to be exhausted early in the year, the bureau published 62 bulletins, 1 annual report, 1 annual statement to the Secretary of the Interior, 6 library leaflets, 2 health education publications, 4 kindergarten circulars, 5 higher-education circulars, 1 reading course, 1 community center leaflet, 8 School Garden Army publications, 1 school-extension leaflet, 24 numbers of School Life, 4 numbers of Americanization, and numerous reprints and miscellaneous documents. The circulation of School Life is approximately 40,000. Its subscription list is composed almost wholly of the names of members of boards of education, superintendents, principals, and teachers. It is a semimonthly school periodical whose columns are devoted to current educational items of interest and to discussions of educational problems both in the United States and foreign countries.

With the cooperation of the National Geographic Society, a Geographic News bulletin to be used as an aid in teaching geography and history was published weekly for the greater part of the school term. It reached a circulation among teachers of 70,000.

STATISTICS.

In 1918 an arrangement was begun by which the educational statistics of each State are to be collected through the State departments of education. This arrangement was completed. Seven chapters of the statistical report for the year 1917-18, those dealing with summer schools, schools for the deaf, blind, and feeble-minded, industrial schools for delinquents, private high schools, and State school systems were compiled and printed. The five chapters on normal schools, nurse-training schools, private commercial schools, public high schools, and city school systems were compiled, but have not yet come from the press. A chapter on colleges, universities, and normal schools and a review chapter of the entire report are not yet completed.

In this report, more than has been the practice heretofore, the important points of educational practice have been focalized in diagrams and graphic representations. A text has been added to clarify the report and explain the methods employed in arriving at certain statistical data and conclusions.

A directory giving the name and location of all the more important educational agencies and the names and addresses of administrative officers in education throughout the United States was compiled and published.

LIBRARY WORK.

The bureau maintains an educational library of 175,000 volumes and pamphlets for the use of its own workers and the general public. As far as is possible with its fund of \$500, the library is kept supplied with the most valuable and up-to-date books, periodicals, pamphlets, and reports on education in several languages. In 1919-20 1,244 volumes were added by gift, exchange and purchase. Copyright transfers from the Library of Congress were 390 volumes; serial numbers accessioned were 3,520; periodical numbers, 8,358; received from the bindery, 656 volumes.

Visitors and research workers are welcomed at the library. Reading tables are arranged for their convenience. During the year 810 calls of consultation were made by people from without the bureau. Volumes are loaned on personal or written request. Two thousand one hundred and fifty-one loans were made, mostly to people outside of the city of Washington.

The library keeps at hand a steadily increasing list of bibliographies for distribution. One hundred and twelve of the earlier lists were revised during the year and 84 new ones were added. In addition there were prepared by the library and published six leaflets, giving lists of references on vocational education, teachers' salaries, the project method in education, education for citizenship, consolidation of schools, and student self-government.

LIBRARY INFORMATION SERVICE.

As an indirect result of the European war, public libraries all over the United States were awakened to the part which the publications of the National Government might and should play in the lives of the people. In order to encourage acquaintance with these publications the Library Information Service in September, 1919, issued a bulletin entitled "The Federal Executive Departments as Sources of Information for Libraries." The bulletin contains brief accounts of the work performed and the kinds of printed matter prepared in the 10 executive departments of the Government.

The general character of the printed matter and the sources from which it emanates having been indicated, the next step was to assist librarians in obtaining the documents which they desired and to call their attention to publications of special interest. The bureau has sought to perform this service to the best of its ability.

ASSISTANCE TO RETURNED SOLDIERS.

Shortly after the close of the war the bureau took up the work of informing returned soldiers of the opportunities offered them by universities, colleges, and other schools.

It was found that within six months after the end of hostilities over 40,000 discharged soldiers had written to the Secretary of the Interior to say that they were interested in his plan to provide work and farms for them. Incidentally, his plan proposed educational opportunities for the ex-soldiers while they were reclaiming the lands they expected to own as farms. Finally, the number writing to the Secretary in regard to the reclamation plan reached a figure above 150,000. While awaiting necessary legislation it was decided to give the first 40,000 inquirers information concerning the special courses arranged for them in the summer schools of the agricultural and mechanical colleges. A separate circular was prepared for each State, so that each one of the 40,000 received something specific about the opportunities offered by his own State institution. Subsequently similar information was compiled relating to short winter courses in the agricultural and mechanical colleges. To answer the many inquiries, circular letters were prepared and sent with such printed mat-

ter as was applicable. The large edition of Higher Education Circular No. 12—"Opportunities at College for Returning Soldiers"—was soon exhausted in answering these inquiries. Many soldier letters were forwarded to the bureau by the chief of the rehabilitation division of the Federal Board for Vocational Education. Before the end of 1919 that division had on file more than 250,000 letters from soldiers needing vocational training. The rehabilitation act provided for the reeducation or vocational training of men who had been discharged from the service with a disability, but the impression had prevailed throughout the Army that all discharged soldiers would be entitled to free vocational education. This caused thousands of able-bodied ex-soldiers to apply to the Federal Board. The Bureau of Education attempted to give helpful information to as many of these ex-service men as possible. The student enrollment in universities and colleges for 1919-20 was the largest in the history of the country, and included many thousands of former soldiers of the World War. It is, however, a regrettable fact that many thousands more were not financially able to resume their school or college courses, interrupted by the war.

HIGHER EDUCATION.

In gathering and arranging information for the field of higher education the bureau completed the work on a bulletin on "Statistics of Agricultural and Mechanical Colleges, 1917-18," which is now in press. It examined, with a view to possible publication as bulletins or higher-education circulars, a large number of manuscripts, of which the following have been accepted and published, or are still in press: "The Rhodes Scholarships, 1919-20"; "How Much Does Higher Education Cost"; "The Rhodes Scholarship, 1920-21"; "The Ohio Plan for the Training of Teachers and the Improvement of Teachers in Service"; "Training Teachers of Agriculture"; "The University Extension Movement"; "Class Extension Work in Universities and Colleges of the United States"; "Public Discussion and Information Service of University Extension"; "Administration of Correspondence Study Departments in Universities and Colleges"; "The Junior College"; "Correspondence Study in Universities and Colleges"; "Development of Agricultural Instruction in Secondary Schools."

The following listed bulletins, prepared for distribution, have been completed and are ready for the press: "Opportunities for Graduate Study at American Universities"; "Opportunities for the Study of Engineering in the United States"; revision of the bulletin on "Opportunities for Foreign Students at Colleges and Universities in the United States"; "Statistics of State Universities and State Colleges, 1919."

Information has been gathered from the colleges and universities concerning the growth and status of the teaching of Slavonic languages and literatures in the United States; general intelligence tests; the teaching of history and citizenship courses in normal schools, colleges, and universities; forestry instruction; and the evolution of the land-grant college curricula. This information will serve as the basis for several circulars and brief bulletins.

RURAL EDUCATION.

Twelve and a half millions of children are enrolled in the rural schools of the United States. How they shall be best taught, how their teachers shall be trained, how the rural schools shall be organized, how their courses of study shall be made most nearly to meet the needs of rural life, and how the education of these children shall differ from that given in cities and towns are all problems of greatest importance in rural-school work. The bureau has studied and reported on such topics as the following:

1. A study of consolidated schools in the United States. This is a report based upon reports of investigations by committees appointed by the State authorities in the various States. It is the most exhaustive study of this important question. Its early publication is especially desirable.

2. A study of the legal provisions for the certification of teachers in each of the States.

3. A study of county libraries based on the ability and need of each county in the United States.

4. A study of worth-while schools from material furnished by certain schools designated by State departments as doing unusually good work.

5. A study of the salary of county superintendents as compared with the salaries of 1916.

6. A study of high-school dormitories in connection with rural high schools in sparsely settled communities.

7. A study of standardization of rural schools as practiced in the various States and the methods employed of awarding State aid for effort in this direction.

8. A study of the salary of all the rural-school teachers in three counties in each of the States. This study has given for the first time a basis for the discussion of rural teachers' salaries as compared with the salaries of other teachers.

9. A study of the shortage of school-teachers in the United States. This study revealed 18,000 schools closed and 42,000 schools taught by substandard teachers. These figures have been accepted as the basis for the Nation-wide discussion of the teacher shortage.

10. A study of the shortage of high-school teachers, which revealed the fact that there will be a need in September, 1920, of at least 15,000 adequately prepared high-school teachers in excess of the visible supply of such teachers.

CITY SCHOOL SYSTEMS.

Informative studies and publications of a general character on city school systems for the year have been few in number because the members of the bureau engaged in that work have devoted much of their time to educational surveys. The schools of villages and towns have been studied and definite and active attempts made to further kindergarten education. Bulletins were prepared and distributed as follows: Administration and Supervision of Village Schools; Schools in the Bituminous Coal Regions of the Appalachian Mountains; Kindergarten Housing and Equipment; and Training Little Children. The bulletin entitled "Training Little Children" contains the series of articles furnished to newspapers by the National Kindergarten Association. The circular entitled "The Child and the Kindergarten" consists of 28 pictures of children engaged in kindergarten activities, with a text which is a running commentary on the pictures. Another circular presents the kindergarten as an effective Americanization agency, and the leaflet entitled "How to Arouse Public Interest in Kindergartens" is No. 1 of a series of extension leaflets. The remainder of the series are in course of preparation, and will contain the kindergarten statistics for 1918. There is to be one for each of the 48 States giving the status of the kindergarten in that State.

Material relating to kindergarten extension has been prepared and distributed in the form of:

1. Ten thousand circular letters sent to kindergarten teachers inclosing practical suggestions for extension activities.
2. Suggestions for those who wish to write kindergarten articles for the press.
3. Requests for reports for Americanization work sent with the Kenyon Americanization bill.
4. Tentative plans for State kindergarten associations.
5. Two kindergarten broadsides containing popular articles on the kindergarten, sent to 5,000 newspapers.
6. Americanization leaflets sent to a mailing list of 25,000 chambers of commerce.
7. An illustrated pamphlet on the kindergarten published in 15 foreign languages and distributed in cooperation with the Young Women's Christian Association.

Other studies begun but not yet completed deal with "The Development of Teachers' Councils," "Certification and Qualifications Required of Junior High School Teachers," "School Practice in Dealing with Gifted Children," and "A Primary Curriculum."

HOME ECONOMICS.

There has been arranged for distribution a complete list of all higher institutions offering home economics work. Material relating to National and State laws affecting home economics teaching has been secured and partly prepared for publication. A questionnaire concerning the status of home economics teaching in public elementary and secondary schools was sent out and the returns in part tabulated. There were prepared for publication bulletins on "Reorganization of Home Economics Courses in Secondary Schools" and "Rural School Lunches."

SCHOOL HYGIENE.

In promoting the cause of public health through the care of the health of school children the bureau has prepared, or caused to be prepared under its supervision, five special studies. These are:

1. A study of school janitor service, based upon questionnaires sent by the bureau to all the cities in the country. This work has been completed within the year, and the manuscript made ready for press.
2. A study of school health supervision. This is based upon questionnaires sent to State, city, and county school authorities, from which more than 2,000 returns were received. The material has been analyzed and classified, and the report is ready for final revision.
3. A study of the one-story school buildings. A letter of inquiry has been sent to the school officials in municipalities where one-story school buildings are known to exist. The study is still in progress.
4. Study of the age-weight-height-grade standards for elementary school athletics. This study has been undertaken by the extension division of the University of Indiana in cooperation with the Bureau of Education.
5. A study of health examinations and physical education in colleges and universities in cooperation with the Society of Physical Directors in Colleges.

TRADE TRAINING.

The National Association of Accredited Commercial Schools requested the cooperation of the bureau in the preparation of standardized courses of study for use by the member schools of the association. In the preparation of these courses it was endeavored to keep in mind two things, namely, the assured ability of the better

business schools of to-day to train for business by the use of standardized courses of study, and the consequent gain thereby to these schools and to business which they would and should efficiently serve. These courses have been submitted to all private business schools on the mailing list of the bureau with the hope that they might be found helpful in standardizing the work at this time of increasing need for better training to meet the new demands of our expanding trade.

Material has been gathered for a descriptive and statistical statement upon the business training courses of Young Men's Christian Association schools, and a report in cooperation with the educational director of this association is now in course of preparation.

It has not yet been possible to print the two reports upon the foreign-trade training surveys that were undertaken. The survey has been finished in 12 of the 15 major cities included in a survey to be carried on in cooperation with the Committee of Fifteen on Educational Preparation for Foreign Service and the Association of Urban Universities. A report upon the results thus far secured was prepared and submitted at the annual meeting of the Association of Urban Universities in Boston, December 12, 1919. The survey of 250 cities with a similar object, which is being conducted direct from the bureau in cooperation with local city school superintendents, is of such magnitude that no complete report can be made before the end of the present fiscal year. The report upon educational preparation for foreign service for use in higher institutions has been completed and advanced for printing as a bulletin of the Bureau of Education. This bulletin has been prepared in collaboration with university specialists and others who speak with authority upon the several subjects naturally included in a course of study in preparation for foreign service.

FOREIGN EDUCATIONAL SYSTEMS.

In treating of foreign educational systems the bureau kept steadily in view the tasks of delineating the changes and developments in the education of foreign countries wrought by the World War and of interpreting them in such ways as should be most useful to American teachers and to the steadily increasing numbers of general readers interested in the currents of international education. It is believed that during the period under consideration educational departures were attempted and effected, especially in the more advanced countries of Great Britain, France, and the Scandinavian countries, which have great educational value for the future American educational polity. This is especially true in the fields of physical and hygienic instruction and adult, continuation, and municipally sup-

ported vocational education; the maintenance of the supply of teachers in rural schools; the systematic increase of teachers' salaries; and the establishment of equitable pension systems for teachers.

The publications along these lines have been:

1. *Schools of Scandinavia, Finland, and Holland.*—In addition to the résumé of school organizations, general movements, and the effect of the war on school work, special attention was devoted to school excursions in Denmark, the communal middle school of Sweden, home and locality as a school subject, school gardens, and school-welfare activities in Norway.

2. *Education in Switzerland.*—In addition to the general résumé of conditions and characteristics, there were discussed health measures as applied in the schools and the practical trend in school work taken during the biennium, with the expansion of preschool service for young children and post-school service for folk-school graduates, and its inclusion of teacher guidance in trades or business.

3. *Education in parts of the British Empire.*—General educational activities of the biennium 1916–1918 along traditional lines were covered, but especial attention was devoted to new movements, such as progressive instruction in agriculture, vocational work for returned soldiers, rural education and the maintenance of the supply of rural teachers, superannuation provisions for teachers, consolidation, short-term sessions, and reorganization of administrative units. Throughout, the diverse social, racial, and climatic conditions which go to affect all educational movements were duly considered.

4. *The schools of Austria-Hungary.*—In this were discussed State or local control of schools, reorganizations now pending, higher education, the teachers, the pupils, and the effects of the war.

5. *Educational conditions in Japan.*—Special developments in administration and curriculum of the middle schools, education of girls and women, and vocational and technical continuation schools were treated.

6. *Some phases of educational progress in Latin America.*—As most completely representative of South American education, the countries of Argentina, Chile, and Uruguay were selected to show tendencies of a general nature as well as movements in the awakening to illiteracy and the struggle against it, educational legislation since 1917, increasingly specialized training of teachers, and the development of rural schools, especially in remote territories. In the cases of Central America, Brazil, and Venezuela the treatment of the educational situation was purposely restricted to practical, vocational, and technical instruction in arts and crafts, these lines showing noteworthy progress.

7. *Natural science teaching in Great Britain.*—Report of the committee appointed by the prime minister to inquire into the position of

natural science in the educational system of Great Britain. This report was at once upon its appearance recognized as possessing so many features of value to American education that the division was authorized to compile and adapt it for such use, omitting the portions applicable only to British conditions and needs.

In addition to the bulletins outlined above there was written Part II (pp. 135-176) of the Report of the Commissioner for 1919. Educational reconstruction, tendencies, and noteworthy events for the period following the armistice were treated:

(a) For France, as illustrated in teachers' unions, regionalism, proposed lines of educational reform, educational legislation and decrees, physical training within and without the schools, primary education from the viewpoints of administration and curriculum, primary teachers, primary agricultural education, higher primary and continuation courses, pre-apprenticeship courses, secondary education for boys and for girls, training in domestic science, growth of sentiment for coeducation, and universities and professional education.

(b) For England there were discussed educational assumption of responsibilities created by the war, secondary education, teachers, agricultural education, and the universities.

(c) For Scandinavia the trend of the schools toward incorporation of the lessons of the war, interrelations among the Scandinavian countries, educational relations with Western Europe and America, the socialization of the schools, and peace movements were discussed, with special attention to the working out of each of these general movements in the individual country.

(d) For Germany the effect of the new constitution upon education and the contrast of the general trend of the schools with that before the fall of the Empire were set forth, as illustrated in religious instruction, the *Einheitschule*, the teachers and the new régime, the extended obligatory period, and the distinctive school reforms in the several German States.

SCHOOL BOARD SERVICE.

Because of inadequate salaries and the high cost of living, the allurements of the business world, and in war time the desire to aid in governmental activity, the teaching force of the United States has been greatly depleted. The difficulty in finding teachers has been so great that in 1918 a school board service division was established to register teachers, especially those so certificated that they could move easily from State to State, and send their names out on request to school authorities.

Through lack of appropriation this service was inactive from July 1 to December 1, 1919, a period of five months, in the fiscal year 1919 and 1920. In December the work was resumed on a deficiency appropriation of \$5,000. An assistant director, with the aid of a stenographic force of three, during the months of December, January, February, and March, rearranged the files of the division and sent a form letter to the 14,000 teachers who had registered in the previous fiscal year. The letter called the attention of each registrant to the reopening of the division, and asked him to reregister, add any further information he might wish to about himself, and signify whether or not it was his desire to be placed on a list of persons who wished to be actively engaged in teaching work and were available for positions. Another letter mailed to all universities, colleges, and normal schools offered the services of the bureau in securing competent instructors. A questionnaire was prepared and submitted to State superintendents of public instruction, in order to ascertain what State offices maintained teacher-placement bureaus, the status of the work, and the method of operation. The replies were tabulated and the tabulations mailed out in response to occasional requests for such information.

In April a director for this work and two assistants in teacher placement were appointed and the force increased to 10 persons.

By circular letter the aid of the bureau was offered to 20,000 high schools, public and private. The immediate response was a call for nominations for 985 teaching positions in the last 16 days of April and 4,101 in May. Approximately 5,000 nominations were made in response to 1,200 of these requests.

The registration files of teachers were steadily augmented by new names, and attempts were made to increase the list of well-trained, competent persons who might accept positions in any State. The division now has a file of approximately 6,000 active registrants.

A classification scheme for arranging the requests by subjects and kind of service desired was worked out. In addition, 5,600 cards were made, on which was placed in condensed form all of the data which came to the division on the requests for teachers. From these there has been begun a study of the nature of the experience and qualifications in teachers more often asked for by school administrative officers and the salaries which they are willing to pay in order to secure the things for which they ask.

A request was sent to all of the State directors of vocational training in home economics, agriculture, trades, and industries in order to ascertain the qualifications necessary for teaching work under the Smith-Hughes law. The returns were indexed, filed, and partially tabulated.

A CLEARING HOUSE FOR EXPERT OPINION ON EDUCATION.

The second important function is "to serve as a clearing house for the best opinions on school organization and administration, courses of study, methods of teaching, and many other matters connected with popular education. For each of these subjects there are a few men and women in the United States and elsewhere whose opinions, because of their greater knowledge of the subject, are most valuable. This bureau tries to find for each subject who these persons are and to make lists of expert advisers whom it may consult and to whom it may refer others. It also undertakes, after correspondence and personal conference with these experts, to formulate the consensus of expert opinion. In carrying on this part of its work the bureau's experts attend and participate in congresses and conferences of educators." In the fiscal year 1919-20 a number of these were held.

It gathers the best opinion available through direct correspondence with individuals by means of questionnaires, by studies of the most important current publications on education, and by special conferences of experts on particular subjects, such as science in secondary schools; home economics in colleges; the better organization of agriculture in elementary schools, high schools, and colleges; health education; Americanization; education in trades and industries; school administration; and education in highway engineering and highway transport. The opinion thus gathered is given out through brief bulletins, addresses, and correspondence.

HIGHWAY ENGINEERING AND HIGHWAY TRANSPORT.

In recent years the National Government has encouraged better public highways by means of very large Federal appropriations contingent upon State and county appropriations. Because of this and because of the enormous transportation problems that arose during the war and which the railroads were not then and are not yet fully prepared to meet, a greatly awakened national interest has been taken in highway transportation. The men who are trying to solve this problem feel keenly the need of trained workers along this line, and are asking that the colleges provide adequate courses in highway engineering and highway transport, and that a much larger number of young men be encouraged to enter them.

To aid in furthering this movement the bureau held a preliminary conference in Washington and took part in other conferences at Detroit and Ann Arbor. As a result of the Ann Arbor meeting the bureau called a national conference at Washington on May 14 and 15. There were present nearly 100 highway engineers, representatives of the State highway departments, automotive and tire industries,

national highway associations and educators, who recommended definite plans for the use of colleges in furthering the interests of highway engineering and highway transport. At the request of the conference the Commissioner of Education appointed a permanent committee of seven members known as the Highway Engineering and Highway Transport Education Committee. The purpose of the committee is to develop a permanent organization working under the best direction to collect fundamental source material covering the entire field of highway engineering, highway transport, and automotive engineering and other cognate research problems for use in preparing suitable textbooks in highway engineering and highway transport. This work is being actively continued and expanded during the present year.

THE JUNIOR COLLEGE.

The last week in June the bureau held a conference of presidents and deans of junior colleges for the purpose of discussing and formulating policies for these institutions which are helping to solve some very important problems in the organization of higher education, and the number of which is rapidly increasing.

AMERICANIZATION CONFERENCES.

A national Americanization conference was held at Minneapolis May 16-18 to discuss educational phases of Americanization and their organization and administration in school, industry, and home. Two hundred and eighteen religious, civic, educational, and industrial bodies of 14 States were represented. The purpose of the conference was to put the Americanization work on a scientific basis. There were considered such topics as Federal participation; the creation of State departments of Americanization; State programs; State supervision; the place of the board of education in city-wide plans of Americanization; the duties of native-born, social, educational, and fraternal organizations in the city-wide plan; the Federal course in teacher training; the course in English; and the industrial program.

At its close the conference adopted resolutions that Americanization be recognized as an educational, social, and economic undertaking; that it is the civic obligation of the public schools to assume the responsibility for selecting and training supervisors and paying teachers for the work; that the public-school equipment be used liberally for recreational purposes for the Americanization school; that the foreign born as well as the native born assume responsibility for the carrying out of the socializing phase of Americanization; and that the Federal Government cooperate with the several States

in the education of the illiterates and other persons unable to understand, speak, read, or write the English language.

The Americanization conference held in Cleveland, Ohio, February 24 and 25, and attended by representatives from the different States, met to discuss the methods by which the Americanization work could be carried on successfully and to review the results obtained in the cities where it has been going on for some time. The Commissioner of Education emphasized the point that Americanization would always be an essential part of education. The general opinion of the conference was that the basic need of the country is to encourage teacher training and to formulate classes for that purpose. In New York State, as a result of the teacher-training work already carried on, it was stated, 5,000 teachers could be put into the work at that time. In Pennsylvania the results of an investigation of the industries to see what Americanization work was being carried on brought out the information that, of the 1,063 plants observed, 751 did some kind of Americanization work comprising welfare work, training in safety and first aid, social and educational departments. In Massachusetts cooperation between the Bureau of Naturalization and the Massachusetts Division of University Extension, through which the Americanization program was carried on, has been successful to the extent that 70 cities have practically adopted the State's program and increased the number of Americanization classes from 3,281 in 1918 to 9,030 in 1919. Other States have had varying success in their efforts, but all showed a tendency toward increased exertion in that direction.

SCHOOLS IN MINING TOWNS.

In November of 1919 a conference was held at Pittsburgh on problems of education in mining towns. It was attended by school principals, superintendents, and teachers, representatives of mining companies in western Pennsylvania and West Virginia, and welfare workers. The meeting considered such questions as vocational training in mining for boys 14 to 18 years of age and for adults; the education of the miner's wife and daughters in home making; grouping mining schools for vocational training in mining; the feasibility of the all-year school; and better financial support for mining town schools.

VILLAGE SCHOOLS.

There are about 12,000 villages of less than 2,500 population in the United States. To consider the welfare of the schools in these was the purpose of a village conference held at Cleveland during the meeting of the department of superintendence of the National Education Association. The program comprised the topics relating to the village school course of study and to the general intellectual and

social life of the village. Its advantages in opportunity for teaching practical lessons in civics, its possibilities for community music and drama, its health conditions, and its relation to the surrounding country were all subjects of discussion.

ADVISORY.

A third activity of the bureau is "to advise legislatures, school officers, teachers, and others engaged in promoting and directing education. Its experts, upon request, address legislatures, meet with legislative committees and commissions, with State, county, and city school boards, with boards of trustees and faculties of normal schools, colleges, and universities, with library commissions, and with other similar bodies. It makes or directs surveys of State, county, and city school systems, and of individual schools or groups of schools, and reports its findings, together with constructive suggestions, to the proper officials."

SURVEYS.

In the fiscal year 1919-20, 12 such surveys were made. Five of these were detailed and comprehensive. The largest and most difficult was an exhaustive inquiry into the entire public and private school system of the Hawaiian Islands. Members of the survey committee spent four months in the islands examining the conditions and the work of the schools. A preliminary report of four chapters that deals with problems of administration and reorganization was printed so that it might be used in a special session of the Hawaiian Legislature. The remaining chapters are now ready for printing. This study is of special interest because it is the first made of any of the insular possessions of the United States, and because of the problems involved in educating several racial groups that differ widely.

Another study was that made of the entire school system of the city of Memphis, Tenn. The difficulties incident upon establishing and maintaining a school system that could expand to meet adequately the educational needs of a rapidly growing industrial city having a large proportion of Negro population were analyzed and constructive programs were submitted to the board of education. The report is issued in seven parts for general distribution. The field work of this survey was made in the fiscal year ended June 30, 1919.

Of equal interest but of an entirely different type is the school system of Winchester, Mass., a well-to-do city suburban to a big city. The bureau made a careful survey of this system. The report is not yet completed.

A complete and careful investigation of a small southern system of city and county schools as represented in the schools of the city of Brunswick and of Glynn County, Ga., was carried to completion. The report will soon be issued for general circulation.

At the request of the superintendent of a cotton mill at Erlanger, N. C., a detailed study of the mill village and its school was undertaken by the bureau. The survey of the school and village paved the way for the reorganization of the whole school system, based upon a course of study especially prepared for the children who live in the community. The State course was followed in the fundamentals and an application of these principles of education was made to the child's experience through a study of the various activities carried on in the mills and the village. The report of this work to be issued later will furnish suggestive material for a daily program in similar schools throughout the cotton belt.*

Seven reports were made on some special phase of one or another school system.

A partial survey dealing only with the building and financial needs of the school department of Lexington, Ky., and accompanied by methods and plans designed to assist in a local campaign for increased bond issues was completed.

The examination of the business methods of the board of education of Augusta, Ga., and of the school department of the city and county in which Augusta is situated, was reported in typewritten form to the board of education. The report comprised a discussion of the financial situation, together with a series of forms carefully worked out in detail with a simple bookkeeping and accounting system for schools of the type to which Augusta belongs. In this the bureau had the help of the Bureau of Efficiency. It is proposed to print this report for general distribution after it has been so modified in details that it is more suitable to the school departments of the smaller cities.

Another study was made of adult education in Passaic, N. J. This comprised a first-hand examination of the social and industrial conditions obtaining in a manufacturing city with an unusually high per cent of foreign population, together with an examination of the means and methods employed by the school department of that city in teaching English to adult foreigners. The report is issued as a bulletin of the bureau.

Surveys limited entirely to the building needs of the school departments were made of the cities of Meriden, Conn., and Gloucester, Mass.

The principle of consolidation as applied to the one-teacher school of a particular township, Mount Joy Township, Pa., was made as a

type study. The report will soon be issued in printed form for general distribution.

A report was made, after careful investigation, to the board of education and board of estimates of Baltimore, Md., on the proposition of erecting a modern school building for the children and people of the Locust Point community. The school for this community had been partially destroyed by fire. The section of the city is one made up largely of foreign-born people, 1,400 or 1,500 of whom are of school age. Recommendations were made for a modern school building erected in a 10-acre park and with ample provision for assembly rooms, laboratories, and shops for the day school and continuation and part-time work, examination and clinic rooms for the use of school and community nurse, reading rooms and rooms for junior high-school work. The report will be published as an industrial education leaflet.

ADVICE IN REGARD TO SCHOOL LEGISLATION.

Through analysis, comparison, and interpretation of school laws, the bureau assists State legislatures in determining what the general legal status of any particular phase of education is and in enacting laws in the light of the best practice and experience. Each year a legislative circular, designed to show the progress and final disposition of proposed school legislation in State legislatures in session, is prepared and distributed to State departments of education and legislative committees. In 1919-20 this piece of work was done, and in addition a bulletin on laws relating to the adoption and supply of textbooks has been brought up to date; the study of public-school revenues previously begun has been continued and is now in a fair way to be carried to conclusion; a special study of continuation-school laws has been prepared; and various agencies interested in the promotion of improved State school legislation have been assisted as far as practicable. There has been completed and submitted for publication the biennial summary and digest of school legislation in the several States. This is a presentation in formal summary of all school legislation enacted by the legislatures of 1918 and 1919.

SCHOOL-PLANT CONSTRUCTION.

The bureau has the part-time service of a special agent who gives help in planning school plants so that they may be adequate, sanitary, and hygienic. This agent is stationed at the George Peabody College for Teachers, Nashville, Tenn. He has kept up a heavy correspondence relating to school buildings, supplied such bulletins on schoolhouses as the bureau had available, helped architects from various parts of the country in making plans and corrections, and

had direct charge in an advisory capacity of constructing a number of school buildings. He has made trips to Johnson City, Livingston, Carthage, McKenzie, Hartsville, Green Brier, and Knoxville in Tennessee, to Paducah and Lexington in Kentucky, and to Albany, Montgomery, and Gadsden in Alabama for the purpose of counseling with school boards and school officers about selecting school sites, planning buildings, and advising in general with reference to the various problems of school equipment.

PROMOTION.

Of perhaps a more constructive character than those already recounted is a fourth line of work carried on by the bureau. This is "to promote on its own initiative and to assist education officers and the people of the several States and local communities in promoting what it believes to be necessary and desirable tendencies in education and in the organization of educational agencies, to the end that there may be full and equal opportunity of education for all." Through its conferences, publications, and correspondence, and by means of addresses at meetings of educators and of citizens, and in consultations with visitors to the bureau, it has done definite work within the year for lengthening the average school term; more adequate salaries for teachers of all grades and kinds; better teacher training; aiding school officials in securing competent teachers; advancing education in agriculture, home economics, trades, and industries; adoption of the work-study-play plan in city schools; the increased use of visual instruction; better school plant construction; better health training; increased school revenues; training for citizenship; education in the home; home gardening; the reorganization of schools so as to give six years to the elementary school and six years to the high school, the six high-school years being divided into three years of junior high school and three years of senior high school; the organization of junior colleges to do thoroughly and well the work of the first two college years instead of attempting without sufficient means to do the full four years of college work; the consolidation of rural schools and the building of homes for teachers; and many other phases of education that experience has shown to be desirable.

A NATIONAL CAMPAIGN FOR EDUCATION.

During the last months of the year the initial steps were taken in a national popular campaign of "education for education." For some time it has been evident that there is need of a nation-wide awakening to a situation which threatens the very foundations of democracy.

Educators have been discussing various phases of the situation and have suggested remedies from time to time. In the belief that the

citizens themselves, rather than educational experts exclusively, should have opportunity to consider these matters, I proposed a national citizens' conference on and for education. In addition to the appeal which you sent to the governors of the several States, invitations were sent to many organizations and individuals known to be interested in education.

The conference was held in Washington on May 19 to 21. Official representatives were in attendance from the Hawaiian Islands, the Philippine Islands, Porto Rico, and all of the States except four. The registration, though not complete, included 525 names, of which 266 were those of representatives of civic and commercial organizations, women's clubs, farmers' organizations, labor unions, editors, and official delegates appointed by the governors.

Of the 25 speakers scheduled for the five general sessions, only 9 were educators, while the remainder represented various civic, social, industrial, and political interests. A number of sectional meetings were arranged for the purpose of stimulating free and open discussion on the part of the delegates.

A national emergency in education.—That the Nation will have to spend two or three times as much money as it is now paying for education; that new sources of revenue and new systems of taxation will have to be discovered; and that immediate emergency measures will have to be adopted, were among the conclusions reached by the conference. The bureau was also asked to create a commission to make a special study of school-revenue problems.

With 110,000 vacancies assured in teaching positions in elementary schools in the United States this coming year, there will be only 30,000 graduates of teacher-training institutions to fill them, leaving a net loss of 80,000 trained teachers, according to figures presented to the conference.

Reports just received from the high schools of the country indicate that the situation will be even more serious in the high schools than in the elementary schools. One-fifth of the 84,000 teachers now in the high schools are reported as intending to leave their positions to enter some other occupation; 8,000 teachers will be needed to fill new positions created next year by the growth of high schools. The greatest possible number of new eligibles for high-school teaching is 9,000, so that 15,000 of the 24,000 positions can not be filled by adequately prepared teachers.

National significance of the shortage.—This shortage comes at a time when the Nation can least afford to neglect education. The new conditions require that the schools shall be more efficient and more effective than they have been in the past, and we are faced with the danger that they may not be so effective as in the past. We are confronted with a great shortage of teachers, and there seems to be little

chance of immediate relief. According to the most careful estimates that can be secured, between 300,000 and 400,000 children were deprived of schooling this past year because of schools closed as the result of shortage.

Even more serious is the rapidly growing number of substandard teachers. More than half the teachers of the Nation—350,000—are not prepared according to any reasonable standard for the work of teaching, a reasonable standard being understood to mean the minimum standard that progressive communities have long insisted upon—two years of professional training beyond the four-year high-school course.

A conservative figure for the number of new teachers that will be required this fall is 110,000. It is more likely to be 120,000, and it may reach 150,000. The number of graduates of normal schools this year is 25 per cent less than in 1916, or about 16,000. If we add to these the graduates from other schools who have had some instruction in teaching and school management, we shall have at the outside 30,000 prepared teachers to fill the vacancies, or a deficit of at least 80,000.

At the close of the conference a general committee on a statement of principles submitted a report in which it pointed out that education is the vital concern of every American citizen; that the number of children and young people seeking an education is constantly increasing and the number of competent teachers constantly decreasing; that since the welfare of the American citizen is a matter of concern equally to the Nation and the State, the National Government should assume a share of the financial burden of offering education, and that there must be provided everywhere more adequate educational funds.

SPECIAL CONFERENCE ON EDUCATIONAL CAMPAIGNS.

The next step was taken by calling a special conference on educational campaigns, to meet in Washington on June 25. There were present at this conference representatives of 34 national organizations, having a combined membership of several million persons, who unanimously promised hearty cooperation in and support of the proposed campaign.

After discussion, the conference adopted unanimously a report offered by the committee on resolutions. The report recites the urgent need for an adequate supply of properly prepared teachers, increased financial support for schools of all kinds, and an entire readjustment of educational programs to meet the demands of the new era.

The conference also went on record as favoring a consideration of the entire educational system of the country as a unit, the promotion

of a comprehensive plan of extensive education, provision for more liberal support of teacher-training institutions, and the adoption of increased salaries for teachers.

The promotion of the national campaign for education and assistance in similar sectional, State, and local campaigns to the extent of its resources will constitute one of the major projects of the bureau during the coming year.

THE NORTH CAROLINA CONFERENCE.

As a result of the National Citizens' Conference on Education, held in Washington May 19-21, many similar State and sectional conferences have been planned. One of these was called by the Commissioner of Education and held at Greensboro, N. C., at the request of the governor and the State superintendent of public instruction of that State, the conference being held a few weeks before the meeting of the conference in Washington. The North Carolina conference was attended by a large number of State officials and educators and citizens interested in all phases of education, public and private. Resolutions were adopted looking toward a large expansion and better organization of the educational system of the State. Many county conferences have been held for the purpose of carrying these to the people and getting their cooperation.

OTHER CONFERENCES.

Somewhat more restricted in their scope and limited in their aims than the national conference were the conferences that were held in commercial, industrial, home economics, rural, higher, and agricultural education.

Commercial.—To meet the increasing demands of the business world for technically trained men and women, the commissioner called 12 preliminary regional conferences and invited representatives of normal schools, colleges, and universities and city school systems to discuss, first, commercial teacher training; second, college entrance credits in commercial branches; third, vocational commercial subjects in relation to general training or the local requirements of business. Nine of these conferences were held between April 10 and June 4. The series was planned to include the whole of the United States.

Industrial and home economics.—Specialists engaged in training teachers of manual training and industrial education in the Mississippi Valley held a conference at the University of Cincinnati. Another such conference was held in Chicago. A meeting of home economics supervisors, lasting two days, was held at Cleveland, Ohio. The reorganization of home economics in secondary courses was the

object of a three-day conference with members of the National Education Association who were serving as a special committee on that subject. The home-economics work in the schools of Grand Rapids, Mich., was discussed in a special meeting with members of the board of education of that city.

Rural.—Conferences on rural education were held at the following-named places; University of Virginia; State normal schools of Texas; Sioux Falls, S. Dak.; Cedar Falls, Iowa; Chandler, Okla.; Emporia, Kans.; Berea, Ky.; Durant, Okla.; Tahlequah, Okla.; Rio Grande County, Colo.; Castine, Me.; and Montpelier, Vt:

These conferences, most of which were attended by educators, statesmen, and representative citizens from the country at large or from adjoining States, were a continuation of an active campaign that has been carried on by the bureau for some years for the improvement of rural schools and rural community life. Special emphasis was placed on longer school terms, better paid and better prepared teachers, the elimination of illiteracy, consolidation of schools wherever practicable, and a course of study based on the needs of country life. The conference at Cedar Falls was devoted almost entirely to the consolidation of schools and has already had valuable results.

LECTURES AND ADDRESSES.

It does not seem necessary to attempt a detailed account of the addresses given by members of the bureau to all kinds of educational gatherings and to mass meetings of citizens, and occasional series of lectures at various institutions throughout the United States. It is deemed sufficient to say that to the extent of the rather limited traveling fund and in so far as other duties permit, bureau members attend at, take part in, and help at all kinds of educational gatherings. Participations of this kind number well into the hundreds each year and constitute one of the regular means by which the bureau promotes educational lines of thought and activity that it believes to be desirable, gives help and advice, and keeps up contact with the live, working educational world.

CITIZENSHIP TRAINING.

The great need for training in citizenship is very evident. The process of civic training is fundamentally the same in all communities; but an essential principle in that process is that it must consist largely in deriving educational values from the actual civic situations in which the young citizen normally finds himself. If he has a background of rural experience, he needs civics instruction that takes its point of departure in that experience and refers back to it. For this reason much time has been given during the past year to a study of

the adaptation of civics instruction to the requirements of schools in rural communities.

For city schools a series of graded "Lessons in civics for the six elementary grades" was prepared. They are unique in their direct and complete organization around activities and experiences arising from situations typical of the years in the children's lives for which they are designed. They are based consistently on the principle that "any material which has a legitimate place in the course holds that place because it is related to some 'civic situation' in which the child is normally to be found and his reaction to which is capable of being modified by a 'civics lesson.'" These lessons were planned in recognition of the necessity of beginning the civic training of the young citizen with the first year of school life and making it continuous. They afford the best preparation *for* citizenship because they provide persistent training *in* citizenship through these early formative years. They constitute a distinct contribution to the available means of "Americanizing" both foreign born and native born, and it is hoped will extend their influence beyond the children in the school to the parents in the home.

These "Lessons in civics for the six elementary grades" are being issued in Bulletin, 1920, No. 18, and are available for use in the schools in quantities at cost price. Their completion and distribution in time for use in the schools in the fall of 1920 was made possible by the cooperation of the Junior Red Cross. The Junior Red Cross also printed for the bureau the "Lessons for the three primary grades" in Teachers' Leaflet No. 9, in order that they might be available during the summer.

SCHOOL-DIRECTED HOME GARDENING.

For a number of years the bureau has endeavored to promote home gardening, directed by the school, in all cities, towns, and industrial villages. In the war period the work was expanded to a "United States School Garden Army" and financed to the extent of \$250,000 from the fund for national security and defense. This lapsed on June 30, 1919. The working force was immediately reduced to conform to the appropriation of \$25,000.

This reduced working force was confronted by the fact that the production of food was the most urgent need of the world. The work of the two previous years was of great assistance from the outset. The mailing list of 36,558 public-school and 3,805 parochial-school teachers who were actively interested and engaged in gardening was of great value. This list has been constantly revised, and at the end of this fiscal year totaled over 45,000 teachers.

Early in the year all the single-sheet mimeographed lessons that had been used during 1918-19 were revised and printed in manual

form. The printed manuals reduced the cost of production and the labor of mailing and added to the attractiveness and usefulness of these lessons. These manuals are used in many schools as teachers' reference texts in connection with the teaching of classroom lessons and also by the teachers as guides when giving instruction in gardening.

Manuals of garden lessons adapted to the five climatic zones of the United States have been published. A short description of each publication is given below.

NORTHEASTERN STATES.

Three pamphlets have been printed for use by teachers in the Northeastern States in the work of the School Garden Army. The first of these is a manual of vegetables, with more than a hundred lessons upon various phases of planning gardens and growing crops. It is divided into 10 sections, as follows: Planning the garden; soils; enriching the soil; the seed; planting the crop; growing the crop; garden crops; garden pests; gathering and disposing of the crop; fall gardening.

The second is a manual treating of flowers in a similar way, illustrated by many photographs of flowers as adapted to school use. It includes the results of many years' experience in growing bulbs, foliage, and flowering plants in connection with school-supervised gardening.

The third pamphlet is devoted to courses in school-supervised gardening, and includes outlines for the first six grades, with definite suggestions upon various phases of nature study and gardening for each grade. The most important of these courses is entitled "A course in gardening based on nature study for the first six grades of the elementary schools," and this course is arranged by seasons and subjects in such a way that it can be followed by any teacher.

SOUTHEASTERN STATES.

"Lessons in School-Supervised Gardening for the Southeastern States" contains 80 practical garden lessons. It is divided into eight sections: Planning the garden; soil preparation; enriching the soil; seeds; planting and care of the crop; garden crops; enemies of the garden; harvesting and use of crops.

Mimeographed outlines for teachers were issued to cover the fall, winter, spring, and summer seasons. A list of vegetables to be planted in each climatical zone, by months and methods of planting each crop, was issued in tabular form.

"Home Gardening for City Children of the Fifth, Sixth, and Seventh Grades" is the result of three years' experience of the special field

demonstrator in Virginia and the Carolinas. This manual is prepared on the project basis and is used as a textbook in many southeastern cities.

SOUTHWESTERN STATES.

The "Garden Manual for the Southwestern Region" contains 84 lessons adapted to the climatic conditions and constituting a year's work in gardening. Teachers' outlines for the four garden seasons were issued at the beginning of each quarter to accompany this manual. Separate outlines were prepared for grades four, five, six, and seven. The suggestions for each school term were designed to be timely and practical.

Forty lessons in gardening are included in "Lessons in Gardening for the Southwestern Region." This publication is adapted for the use of teachers who wish to conduct the work during the second school semester and summer vacation. It is also adapted to use in schools giving one lesson per week throughout the year.

Manuals on fruits and flowers are now in preparation.

CENTRAL STATES.

"Lessons in gardening for the Central States region" have been brought together in Garden Manuals Nos. 1 and 2. Manual No. 1 deals with "Getting the garden ready and planting and caring for the crops." Manual No. 2 is divided into "Planting and caring for crops" (vegetables not covered in No. 1), "Preventing and controlling pests and plant diseases," and "Getting ready for next year's crop." These two manuals constitute a year's course in vegetable gardening.

A teacher's outline was issued at the beginning of each quarter to accompany the manuals.

WESTERN STATES.

The manual of school-supervised gardening for the Western States is divided into two parts: Part 1 contains 48 practical garden lessons dealing with the problems peculiar to the Western States; part 2, "Suggestions to teachers," contains outline courses of study, suggestions for organization, and plans for keeping up interest in garden work with children.

The information contained in the manuals of garden lessons is not new from a horticultural standpoint. Experiences of four years in promoting gardening, however, had demonstrated conclusively that the public-school teachers could make very little use of the average garden bulletin without reorganizing the material completely. The information, word and sentence formation, in these

manuals was therefore simplified to conform to the ages and school grades of children they were intended to reach. For the convenience of the teachers all manuals were divided into lessons adapted to the seasons of the year and the varying climatic conditions of the regions.

Owing to the limited editions of the manuals of garden lessons it was necessary to restrict free distribution to teachers and supervisors of gardening. As practically all of these instructors used the manuals as guides for classroom instruction, it is conservative to estimate that garden information was taught to at least 20 pupils per teacher, or a total of 4,229,760 children. The following supplies were mailed from this division during the year:

Plan of the Garden Army in 1920.....	74, 614
Manuals of garden lessons.....	211, 488
Spring manuals.....	67, 800
Fall manuals.....	1, 492
War gardening and storage of vegetables.....	39, 800
Home canning and drying.....	54, 100
Posters.....	104, 411
Insignia.....	687, 991
Service flags.....	11, 348
Pageants (victory of the gardens).....	4, 553
Enlistment sheets.....	128, 500
Newspaper broadsides.....	34, 076
Record blanks.....	37, 410
Certificates.....	173, 000
School Garden Army Leaflet No. 1.....	16, 014
Personal letters.....	6, 533
Mimeographed leaflets (Teachers' Outlines, etc.).....	2, 299, 465

This list of garden supplies distributed to schools includes only that mailed from the Washington office. The regional directors, assistant regional directors, and State directors have assisted the central office by writing many personal letters to school officials outlining methods of organization of garden classes, the place of garden instruction in the course of study, and answered practical questions as to the best garden practices.

Four sets of lantern slides which were added to the equipment of this division were used in visual instruction. Lectures on gardening were written to accompany these slides. Sets of slides were loaned to garden supervisors and teachers, and, together with the moving-picture films purchased in 1919, were in constant use. Through the medium of slides and films the garden message was conveyed to thousands of adults and children. This part of the work could be expanded with profit. Sets of slides and films showing actual garden practices for a year under differing climatic conditions would be invaluable supplements to classroom and field instruction.

Two monthly series of broadsides were sent to the press mailing list. One series comprised a number of stories based on the myths and legends of literature into which was ingeniously woven practical garden information; and the other series contained practical garden lessons of the month which was distributed during the growing season.

FIELD SERVICE.

Under the plan of reorganization the regional director for the Southeastern States was promoted to the directorship. The States under his supervision were placed under the direction of the regional director for the Southwestern States. The territory in this reorganized region was so large and the distances between cities so great that the States of Colorado and New Mexico were transferred to the Western States region and Kentucky to the Central States. The regional directors for the Western and Southwestern States were continued on full-time and the services of the Central and Northeastern States directors were retained on a part-time basis. The 29 assistant regional directors were discontinued because of lack of funds.

The granting of a deficiency appropriation, in November, made it possible to enlarge the field force. The real success of promotion of a new educational project depends largely on personal work of field representatives. Rigid economy was, therefore, practiced in the central office in order that the field force might be increased. Assistant regional directors were appointed in the Central and Northeastern States, the regions having the largest city population. An assistant regional director was also appointed for the southwestern region, but as he resigned after one month's service the position was not continued. Part-time assistant directors, who limited their work to single States or sections of several States having large city population, were appointed as follows: One in the Northeastern States, two in the Central States, two in the Western States, and three in the Southern-Southwestern States. Sixty-three collaborators assisted in promoting gardening either in large cities or geographical regions.

The directors and assistant directors attended State teachers' associations, teachers' institutes, and public meetings where the maximum number of teachers could be reached by minimum travel. The reduction in the number of directors of the previous year made it impossible to give the same personal assistance in organizing the work as was given last year. The results of the previous year were constantly referred to, and by holding conferences in important centers and by much correspondence a high quality of service was rendered by the field agents.

MANUSCRIPTS COMPLETED.

A leaflet by the Commissioner of Education, outlining the educational and economic value of school directed home gardening, has been reprinted and widely distributed. A printed folder, which could be used as a poster on school bulletin boards, and mimeographed leaflets outlining the plan of the Garden Army in 1920, were issued. Each regional director prepared an outline course of study adapted to the four seasons in his region. The course of study for the Northeastern States was published and the others went to teachers in mimeographed form. The manuals of garden lessons and courses of study form comprehensive and fairly complete junior project publications.

PLANS AND POLICIES OF THE YEAR.

The main effort of the year has been to make gardening a more permanent part of the school curriculum and to increase the educational value of the subject. It was clearly seen that the motto of the Garden Army "A garden for every child, every child a gardener," could only be realized when gardening became a definite part of school work. This aim on the part of the Garden Army officials to work for permanency and greater educational efficiency conformed to the desires of school officials. It is estimated that more than 2,000,000 children did leisure garden work under the direction of individuals and produced last year more than \$40,000,000 of food.

VISUAL INSTRUCTION.

During the war the National Government made and used for various purposes great numbers of moving pictures. With the inception of peace the films of these were largely useless for governmental activities. It was believed that they might serve an excellent purpose, both in direct instructional value and in promoting the more general use of the moving picture as a school aid, if they were distributed to schools throughout the United States.

The Bureau of Education received 2,160,000 feet of film during the fiscal year ending June 30, 1920, and deposited 982,000 feet with its State distributing centers. It now has a total of 8,275,000 feet of film, 4,927,000 feet of which are in circulation, and the remaining 3,348,000 feet are held in the vault to be repaired, assembled, and inspected. The film material was received through the very courteous cooperation of the departments of the Government, of allied organizations, and industrial companies, as shown by the lists which follow.

The distribution of films has been carried on through the extensive cooperation of the extension departments of the State universities,

which act as distributing centers for their respective States, and are held responsible for the proper circulation of films in their own territory. It is to be understood, then, that the bureau does not send out films direct to users, but releases and deposits such films with its State distributing centers, where universities, normal, high, and elementary schools, churches, Young Men's Christian Associations, community centers, etc., may obtain the use of them for educational and recreational exhibitional purposes. There are now a total of 42 distributing centers, 11 of which were established during the past fiscal year. The work is, therefore, principally the salvaging of educational and war films and systematically distributing them throughout the country for use through educational and other public organizations.

The war films in circulation cover a fairly complete review of the war, and include the following topics: Communications and camouflage in modern warfare, work of the American engineer, the transportation of men and supplies, lumbering and shipbuilding, construction of airplanes, the Air Service, sports and entertainment for soldiers, American Expeditionary Forces activities and actual battle scenes, care of the wounded, modern ordnance, chemical warfare, submarines, generals and officials of the war, feeding the Army, training of the soldier, and keeping the Army well. Among the educational films the following topics are the most important: Health, oral hygiene, surgery, rehabilitation of the crippled soldier, industry, road building, agriculture, farming, Coast Guard defense, and travel.

A system has been outlined whereby State distributing centers are required to submit monthly reports stating where the films were shown, date, and attendance. The system has worked very successfully. It appears from the reports submitted during the past seven months, the period during which this system has been in operation, that the 4,927,000 feet of film in circulation were exhibited to 8,600,000 persons.* The records indicate that the average attendance at each exhibition was 300. A local distributing service is also carried on from this office for the benefit of educational institutions, Government bureaus, and civic organizations in the District of Columbia. Approximately 720,000 feet of film was circulated in the District, with an average attendance of 350 per exhibition.

The 30,000 lantern slides collected were deposited with distributing centers, where they may be procured for educational purposes. Distributing centers also receive slides and films from other sources. The following motion-picture subjects were assembled and edited and prints reproduced from the negative for circulation: "Camouflage in Modern Warfare," "Communications on the Battle Field," and "Making the Desert Blossom." Three thousand feet of leader film, entitled "U. S. Government Film—Distributed by the Visual

Instruction Section—U. S. Bureau of Education—Department of the Interior," was printed and placed on the films which are being circulated.

Approximately 50,000 feet of negative on medical subjects was loaned by the Surgeon General's Office, War Department. The negative was cut and assembled and arranged in proper condition to reproduce positive prints. Plans were arranged so that educational institutions could secure copies at cost of production.

The following two motion-picture bulletins were published: Educational Institutions Equipped with Projection Machines; Motion Pictures and Motion Picture Equipment.

The titles of a great many of the film subjects were copied and mimeographed and copies mailed to distributing centers. Many valuable lists were made available to the public, showing where educational films on specific subjects could be secured. Other valuable data on motion-picture activities were compiled. A great deal of time was consumed in examining and exhibiting educational films sent by various organizations for synopsis and approval of their educational value.

EDUCATION IN THE HOME.

Along this line the purposes have been to bring education into the homes of those who have had limited opportunities; to help parents in the care and training of their little children before they are of school age; and to promote a closer cooperation of home and school so that parents and teachers may work together intelligently for the best interests of their children. In furthering these purposes 22 reading courses have been prepared, of which 17 have been issued in leaflet form and distributed. Sixteen of the courses were "After-war courses" and about 150,000 of these have been distributed in the camps and cantonments. About 13,000 readers reading for formal recognition have been enrolled in the various courses in all States, the largest enrollments being in New York, Pennsylvania, Ohio, California, Illinois, and Massachusetts.

A plan of cooperation between the State departments of education, extension departments of State universities and the bureau in connection with the home-reading courses was arranged. This plan has been presented in Virginia, Pennsylvania, Massachusetts, Rhode Island, Connecticut, Wisconsin, Indiana, Kentucky, South Carolina, North Dakota, South Dakota, Arizona, and Iowa. In nine of these States it has been accepted and put into operation and special collaborators appointed to carry out the work. These States are Indiana, Kentucky, North Dakota, South Dakota, Virginia, South Carolina, Arizona, Iowa, and Wisconsin.

Through the courtesy of the American Library Association, which has cooperated in the preparation of new reading courses, the following courses are ready for printing: *Heroes of American Democracy*, *The Call of Blue Waters*, *Iron and Steel*, *Shipbuilding*, *Machine-Shop Work*.

These vocational courses are issued as a series of "After-war courses" and are offered to meet the demand for such courses from men who have not had technical training, but who wish to read books of technical value in their field of labor; 96,343 reading courses, 1,821 bulletins, and 5,000 posters have been sent out. Through women co-operators in North Carolina 44,058 "After-war courses" have been distributed to returned soldiers in that State.

COMMUNITY ORGANIZATION.

The public-school plant may be as effective a headquarters of adult-citizen expression as it is a center of child instruction. It affords for the people a ready medium of service contact by which the community may deal with such problems as public health and sanitation, improvement of agricultural and industrial methods, promotion of thrift, and processes of Americanization.

For 1919-20 the bureau has aided the growth of the sentiment for the use of the school as a community center by giving special help to the actual community development, which is going forward within and out from the District of Columbia, and by the presentation of the community-center program in addresses and conferences in various parts of the country.

Community-center development in the District of Columbia has been legally recognized and supported by congressional appropriation for three years. It is hoped that the work in the District will serve as an example and radiation base for its spread throughout the Nation. Assistance has been given to the 17 sections thus far organized in the District by holding a series of weekly meetings with the community secretaries, by coordinating the civic, recreational, and economic use of the school plant by adults and older youth, and by inaugurating a plan of cooperation between the public school and the Postal Service.

In presenting community-center programs to the country at large 104 single lectures were delivered to State conventions, teachers' institutes, chambers of commerce, and similar organizations. Special courses of six lectures on community work were delivered at Rock Hill, S. C.; Peabody College, Tennessee; Glens Falls, N. Y.; University of North Carolina; Charleroi, Pa.; Pittsburgh, Pa.; University of Virginia; Berea College, Kentucky; University of Kentucky; and Bloomsburg, Pa.

A plan was developed for cities and counties and put in operation in one State by which the municipal and volunteer agencies of public welfare can coordinate their activities and prevent waste of money and good will.

The far-reaching results of this work of the bureau is shown by the fact that the principle of community organization with the schoolhouse as the center is now generally accepted, and both in city and in county new schoolhouses are planned for the use of the adult population of the country as well as for the use of the children. Probably no single educational movement has such great possibilities for good.

CHILD HEALTH.

The bureau has furthered better health teaching in the public schools and better observance on the part of the children of the common rules of healthful living. The outline of the program is briefly as follows:

1. A pair of scales in every school and every child weighed and measured monthly. (Weight for height and age is accepted as an index of nutrition and progress in growth.)
2. Time definitely laid aside for the teaching of health.
3. Health report sent home on monthly report card.
4. School lunch available for every child.
5. Correction of physical defects with special care for malnourished children.

A series of health-education pamphlets have been prepared and printed. It consists of the classroom weight record and seven pamphlets. Four of these, "Wanted, Teachers for Child Health Service," "Diet for the School Child," "Summer Health and Play School," and "Teaching Health" were published before July, 1919. These pamphlets have filled a widespread demand and have had a very large sale through the Superintendent of Documents. Three new pamphlets in the series have been issued during the year—"Child Health Program for Parent-Teacher Associations and Women's Clubs," "Further Steps in Health Teaching," and "The Lunch Hour at School." The height and weight tables compiled have been printed in large poster form to meet a demand from clinics, schoolrooms, etc.

The health education of the bureau has been carried on largely through correspondence and distribution of literature. The demand for assistance has been enormous and varied, as shown by the many letters (over 6,000) received during the year. Personal attention has been given to all letters and approximately 500,000 pieces of material have been sent upon request. Assistance has been given not only to teachers, but to requests and inquiries which have poured in

from Red Cross workers, home demonstration agents, public health nurses, tuberculosis associations, women's clubs, departments of health, hospitals, libraries, etc. Public health agencies and associations have realized the importance of universal health education, and have shown great interest and cooperation in the furtherance of our program. Sometimes a school has become interested through a school nurse, or a home demonstration agent, or a Red Cross worker. Often an individual teacher has started weighing and measuring in her classroom, and from her room it has spread into the whole school system. Sometimes the home economics department introduces the plan. Sometimes it is brought in in connection with a milk campaign or a poster contest in the art department. The child health organization of New York has done much for the promotion of this program in bringing it to the attention of teachers and school officers and otherwise.

RESEARCH WORK TO DETERMINE STANDARDS IN EDUCATION.

The fifth activity of the bureau, and one to which it has been able to give the least attention because no appropriation has been made for it, is "to determine standards of measurement in education and to conduct and direct experiments in education, to the end that we may finally have a larger body of definite scientific knowledge about education and educational processes and methods." In September, 1919, the commissioner arranged a plan for the establishment of research stations to utilize in a national way such special resources and facilities as might be placed at the disposal of the bureau by cooperating institutions. The plan contemplates a cooperative arrangement in each case between the bureau and an educational institution.

The essential features of the plan are:

1. Selection by the Commissioner of Education of a number of educational institutions to be invited to participate.
2. Acceptance by president and board of trustees of the terms and conditions outlined.
3. Recommendation by the president of the institution of one or more representatives to serve as special collaborators of the Bureau of Education, at the nominal salary of \$1 per year each.
4. Appointment of special collaborators, by the Secretary of the Interior, upon recommendation of the Commissioner of Education. Of the special collaborators forming the staff of each research station, one will be informally designated "director" by the Commissioner of Education.
5. Acceptance by appointees of appointments as special collaborators, who will then take the oath of office and file papers furnished by the Commissioner of Education.

6. Approval of definite projects and procedure by the Commissioner of Education, after correspondence with the director of each research station.

7. Consideration by the Commissioner of Education of reports made by the several research stations, and publication of those found to be available.

8. Due credit will be given to stations and individuals for direction of projects and authorship of reports.

A large number of topics were suggested as typical of studies and investigations that seemed to be worthy of attention. Stations were established at the universities of California, Illinois, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, North Carolina, Texas, Utah, Wisconsin, Virginia, Washington, Cornell University, and the Oregon Agricultural College. Among the questions being studied are: Common knowledge of health matters; the drama in colleges and universities; student loan funds; democratic elements now existing in American education; student self-government; educational tests; the use of the motion picture in the schools; and the education of girls and women. The work of these stations was organized and given direction in two conferences of the directors held at St. Louis and at Cleveland, Ohio.

Section II.

ADMINISTRATIVE DUTIES.

LAND-GRANT COLLEGES.

Congress has authorized the Bureau of Education to perform certain duties in connection with the administration of the income resulting from the principal obtained by the sale of lands granted under the first Morrill Act, an amount approximating \$1,009,225, and of the Morrill-Nelson fund, which amounts to \$2,500,000 annually, \$50,000 a year going to each State. The bureau is required to see that the interest from the first fund is at least 5 per cent and that it is expended according to the requirements of the first Morrill Act. It must also audit the expenditure of the \$50,000 granted annually to each State for the college or colleges of agricultural and mechanic arts. Very definite limitations are set on the expenditure of these moneys and the bank interest on them must be used for the original purposes of the act.

The bureau must also prepare annually reports based upon information received from these institutions regarding the financial administration of the land-grant colleges. The report for 1917-18 shows that 125,673 young men and women were being educated in

them. For the year 1919-20 there will probably be an increase of 25 per cent over that number. Each institution having met the requirements, the Commissioner of Education then certifies to the Secretary of the Interior that the money has been spent according to law. He also certifies to the President of the Senate and the Speaker of the House of Representatives authorizing Congress to continue the annual appropriations according to the Morrill-Nelson Acts.

ALASKA.

The greater part of the administrative duties of the bureau are those connected with the education, medical relief, and support of the natives of Alaska.

During the year the field force of the Bureau of Education in Alaska consisted of 6 superintendents, 133 teachers, 9 physicians, and 13 nurses. Sixty-seven schools were maintained.

As the result of the epidemics of influenza among the natives of northern and western Alaska during the autumn of 1918 and the spring of 1919 about 250 children were left orphans. In the Nome region it was found possible to distribute the orphans among Eskimo families, but in the Bristol Bay and Cook Inlet districts it was necessary for the bureau to assume their entire care in orphanages which were erected at Kanakanak and Tyonek.

The appropriation of \$80,000 for medical relief was expended in maintaining hospitals at Juneau, Kanakanak, Akiak, Nulato, and Kotzebue; 9 physicians and 13 nurses were employed. To assist them in providing medical relief, each teacher is provided with a standard medical equipment with which to attend to ordinary ailments and less serious injuries.

The rehabilitation of the colony at Metlakatla, on Annette Island, is progressing satisfactorily. In 1917 the Secretary of the Interior, on behalf of the Metlakatlans, entered into a five-year lease with the Annette Island Packing Co., of Seattle, granting fish-trap privileges within the reserved waters adjacent to Annette Island and permission to erect and operate a cannery within the reserve. The returns to the Metlakatlans for fish royalties, trap fees, labor, and for lumber purchased from the local sawmill amounted during the season of 1919 to \$90,032.88. It is hoped that in 1921 the revenues accruing from the lease will enable the Secretary of the Interior to take over for the Metlakatlans the property of the lessee within the reserve and to arrange for the operation of the cannery by the natives themselves. The Metlakatla Commercial Co., organized by the Bureau of Education, continues successfully to conduct the mercantile business of the colony and to operate the sawmill. The importation into Alaska of laborers needed by the salmon canneries has been a trouble-

some problem to the operators of the canneries and a great detriment to the natives of the villages in which the canneries are located. The Metlakatla Commercial Co. successfully fulfilled its contract with the Annette Island Packing Co. for the furnishing locally of the labor required by the cannery in Metlakatla, thus solving the problem in so far as their village is concerned.

Assuming that there has been the usual net increase of 20 per cent in the number of reindeer during the year, there should be, approximately, 180,000 reindeer in Alaska June 30, 1920. The magnitude and value of the industry have resulted in the making by Congress of an appropriation to enable the Bureau of Biological Survey, Department of Agriculture, in cooperation with the Bureau of Education, to make investigations, experiments, and demonstrations for the improvement of the reindeer industry in Alaska; the Chief of the Biological Survey has proceeded to Alaska in order to organize this work. The distribution of reindeer among the natives and the use of the enterprise as the form of industrial education best adapted to the races inhabiting the untimbered regions of Alaska will remain under the supervision of the Bureau of Education.

Regulations were adopted making effective the authority granted by Congress for the sale of surplus male reindeer belonging to the Government and the use of the proceeds of such sales in the extension of the industry. The first sale under these regulations was made at Mountain Village, on the Yukon River, during the autumn of 1919. Under judicious management the proceeds of such sales might provide the funds necessary for the support and extension of the reindeer industry independently of appropriations made by Congress. It is very desirable that the reindeer industry be extended into the region tributary to the Government railway in Alaska. The area suitable for pasturage of reindeer in the Broad Pass region, reached by the railway and extending eastward along the northern and southern slopes of the Alaska range is, approximately, 12,000 square miles. Most of this region is timberless and more than 2,000 feet above sea level; it is, therefore, swept by mountain breezes, which would serve to protect herds against mosquitoes and flies. After the Government has demonstrated the practicability of raising reindeer in that part of Alaska, private owners would undoubtedly drive their herds into that region in order to avail themselves of the market afforded by railway transportation.

The 67 villages in Alaska in which the work of the Bureau of Education is carried on are scattered along thousands of miles of coast line and on the great rivers. Very many villages are not on the routes of commercial vessels. Some of the settlements can be

brought into touch with the outside world only during the short season of open navigation in midsummer. The securing of transportation from Seattle to their remote destinations of teachers, physicians, and nurses, and of the supplies and building materials required in the Alaska school service, the Alaska medical service, and the Alaska reindeer service is an undertaking of great difficulty. The problem was acute during the summer of 1919, transportation to and in Alaska being in a chaotic condition as the result of war conditions and because vessels carrying freight for western and northern Alaska had left Seattle before the passage of the appropriations for the support of the work of the Bureau of Education in Alaska. Even on the established routes rates were excessive and steamers were unable to maintain their time schedules; there were long delays of passengers and freight at transfer points; in several instances excessive emergency transportation of employees and supplies had to be secured. For a long series of years the Coast Guard Service, through its vessels cruising in Alaskan waters, has willingly cooperated with the Bureau of Education, but its vessels are not adapted to the carrying of passengers and freight, and they have numerous other duties to perform.

Experience has shown that the work of the Bureau of Education in Alaska can never be administered effectively and economically until the bureau owns and controls its own vessel. Request was therefore made to the Navy Department for a vessel suitable for use by the Bureau of Education in connection with its work in Alaska. Complying with the request, the Navy Department transferred to the Department of the Interior the U. S. S. *Boxer*, a staunch wooden vessel with a carrying capacity of about 450 tons and admirably adapted for the purpose contemplated. The endeavor to secure a congressional appropriation to meet the expense of refitting the *Boxer* for service in Alaskan waters did not meet with success. The vessel is held at the Naval Training Station, Newport, R. I., pending the securing of an appropriation.

The vast extent of the Territory, the remoteness of many of the settlements, and lack of transportation facilities make the taking of the census of Alaska a matter of great difficulty. At the request of the Bureau of the Census, Mr. W. T. Lopp, superintendent of education of natives of Alaska, was placed in charge of the entire work of the Alaska census of 1920, with the bureau's superintendents, physicians, and teachers in all parts of the Territory as special agents and enumerators. This cooperative arrangement, while greatly increasing the duties of the bureau's employees during the year, proved to be mutually economical and advantageous.

ORGANIZATION OF THE BUREAU.

The bureau is organized under the following divisions: Office of chief clerk, editorial, statistical, library, city school systems, higher education, rural education, foreign educational systems, industrial education, home economics, home education, school hygiene, civic education, school-directed home gardening, community organizations, Americanization information service, visual instruction, school-board service, Alaska, and stenographic. Because of decreased appropriations the work in school-directed home gardening, Americanization, and school-board service was greatly curtailed. A specialist in industrial and economic relations in education was added to the city school division. Specialists from the bureau have worked with the Committee on Reclassification of Salaries, the Interdepartmental Social Hygiene Board, and the Red Cross. The lines of work carried on by the several divisions have been given in the general statement.

LIST OF PUBLICATIONS.

A list by title of the publications of the bureau for the year is here given:

BULLETINS, 1919.

2. Standardization of Medical Inspection.
6. A Half Time Mill School.
8. Life of Henry Barnard.
15. The Adjustment of the Teaching Load in a University.
20. The Rural Teacher of Nebraska.
22. A Survey of Higher Education, 1916-1918.
28. Educational Periodicals during the 19th Century.
29. Schools of Scandinavia, Finland, and Holland.
31. Summer Schools in 1918.
35. The Junior College.
36. Education in Italy.
37. Educational Changes in Russia.
38. Education in Switzerland, 1916-1918.
39. Training Little Children.
40. Work of the Bureau of Education for the Natives of Alaska, 1917-18.
41. Educational Study of Alabama. Reprint of Chapter 2.
43. Education in France in 1916-1918.
44. Modern Education in China.
45. Accredited Secondary Schools of the North Central Association.
46. Bibliography of Home Economics.
48. Educational Hygiene.
49. Education in Parts of the British Empire.
50. The Public School System of Memphis, Tenn.
 - Part 1. An Industrial and Social Study of Memphis; School Organization, Supervision, and Finance; The Building Problem.
 - Part 2. The Elementary School; The High Schools.
 - Part 3. Civic Education.
 - Part 4. Science.
 - Part 5. Music.
 - Part 6. Industrial Arts, Home Economics, and Gardening.
 - Part 7. Health Work.

51. The Application of Commercial Advertising to University Extension.
52. Industrial Schools for Delinquents, 1917-18.
53. Educational Work of the Young Men's Christian Association, 1916-1918.
54. The Schools of Austria-Hungary.
55. Business Education in Secondary Schools.
56. The Administration of Correspondence Study Departments of Universities and Colleges.
57. Educational Conditions in Japan.
58. Commercial Engineering.
59. Some Phases of Progress in Latin America.
60. Monthly Record of Current Publications, September, 1919.
61. Public Discussion and Information Service of University Extension.
62. Class Extension Work in the Universities and Colleges.
64. Library Activities, 1916-1918.
66. Training Teachers of Agriculture.
67. Monthly Record of Current Educational Publications, October, 1919.
68. Financial and Building Needs of the Schools of Lexington, Ky.
69. Proceedings of the Fourth Annual Meeting of the National Council of Primary Education. (Held at Chicago, Ill., Feb. 25, 1919.)
70. Schools and Classes for Feeble-Minded and Subnormal Children.
71. Educational Directory.
 - Part 1. Government Educational Activities.
 - Part 2. Public School Systems.
 - Part 3. Higher Education.
 - Part 4. Special Schools.
 - Part 5. Summer School Directors.
 - Part 6. Libraries and Museums.
 - Part 7. Miscellaneous Educational Organizations.
72. An Abstract of the Report of the Public School System of Memphis, Tenn.
74. The Federal Executive Departments as Sources of Information for Libraries. (Also Reprint.)
75. Monthly Record of Current Educational Publications, November, 1919.
76. Community Americanization.
77. State Americanization.
78. Schools and Classes for the Blind, 1917-18.
79. Schools for the Deaf, 1917-18.
80. Teaching English to Foreign-Born.
82. Motion Pictures and Motion-Picture Equipment.
83. Monthly Record of Current Educational Publications, December, 1919.

BULLETINS, 1920.

1. The Problem of Mathematics in Secondary Schools.
2. Monthly Record of Current Educational Publications, January, 1920.
3. Private High Schools and Academies.
4. The Problem of Adult Education in Passaic, N. J.
5. Monthly Record of Current Educational Publications, February, 1920.
6. Monthly Record of Current Educational Publications, March, 1920.
11. Statistics of State School Systems, 1917-18.
14. Monthly Record of Current Educational Publications, April, 1920.
15. Monthly Record of Current Educational Publications, May, 1920.
16. A Survey of Education in Hawaii. (Preliminary Edition.)

REPORTS.

- Annual Statement of the Commissioner, 1919.
 Annual Report of the Commissioner, 1918-19.

LIBRARY LEAFLETS—LIST OF REFERENCES.

- No. 3. List of References on Play and Playgrounds. (Reprint.)
- No. 5. List of References on the Junior High School. (Reprint.)
- No. 6. List of References on Stories for Young Children. (Also Reprint.)
- No. 7. List of References on Vocational Education.
- No. 8. List of References on Teachers' Salaries.
- No. 9. List of References on the Project Method in Education.
- No. 10. List of References on Education for Citizenship.
- No. 11. List of References on Consolidation of Schools.

HEALTH EDUCATION SERIES.

- No. 1. Wanted Teachers to Enlist for Child Health Service. (Reprint.)
- No. 2. Diet for the School Child. (Reprint.)
- No. 5. Child Health Program.
- No. 6. Further Steps in Teaching Health.
 - Poster—Right Height for Boys. (Also Reprint.)
 - Poster—Right Height for Girls. (Also Reprint.)
 - Classroom Weight Record. (Reprint.)
 - Folding Poster—Right Height and Weight. (Reprint.)

KINDERGARTEN CIRCULARS.

- No. 4. Manufacturers Endorse the Kindergarten.
- No. 5. The Kindergarten as an Americanizer.
- No. 6. The Child and the Kindergarten.
- Kindergarten Extension Series No. 1.
- Answers to Objections to the Kindergarten. (Reprint.)
- Broadside—The Kindergarten Division.

SECONDARY SCHOOL CIRCULARS.

- No. 5. The Reorganization of the First Courses in Secondary School Mathematics.

HIGHER EDUCATION CIRCULARS.

- No. 15. Increases in Salaries of College Teachers.
- No. 16. The Rhodes Scholarships.
- No. 17. How Much Does Education Cost?
- No. 18. The Ohio Plan for the Training of Teachers and the Improvement of Teachers in Service.
- No. 19. The Rhodes Scholarships, 1920.

INDUSTRIAL EDUCATION CIRCULARS.

- No. 3. Industrial Art as a National Asset. (Reprint.)
- No. 4. The Army Trade Tests. (Reprint.)

HOME ECONOMICS CIRCULARS.

- No. 2. Current Problems in Home Economics. (Reprint.)
- No. 4. Principles and Policies in Home Economics Education. (Reprint.)
- No. 5. Government Publications for Home Economics Teachers and Students. (Reprint.)

READING COURSES.

- No. 6. Thirty Books of Great Fiction. (Reprint.)
 - Thirty Books of Great Fiction. (Section A—Reprint.)
 - Thirty Books of Great Fiction. (Section B—Reprint.)

- No. 7. Thirty World Heroes. (Section B—Reprint.)
 Thirty World Heroes. (Section C—Reprint.)
 No. 10. American History. (Section A—Reprint.)
 American History. (Section B—Reprint.)
 No. 11. France and Her History. (Also Reprint.)
 Broadside—Greatest Books of All Ages.
 Posters—Your Public Library is Free—Use It.

COMMUNITY CENTER CIRCULARS.

- No. 3. The Forum.

SCHOOL LIFE.

- Volume 3: Nos. 1-12.
 Volume 4: Nos. 1-12.
 Volume 4: Nos. 9-10, May 1-15, 1920, Reprint pages 14-15.
 Index and title-page, volume 2, January-June.
 Index and title-page, volume 3, July-December.

AMERICANIZATION.

- Americanization, August 1, 1919.
 Americanization, No. 13, September 1, 1919.
 Americanization, vol. 2, No. 2, October 1, 1919.
 Americanization, November 1, 1919.

UNITED STATES SCHOOL GARDEN ARMY SERIES.

- A Manual of School-Supervised Gardening for the Northeastern States. Part I. Vegetables. (Also Reprint.)
 A Manual of School-Supervised Gardening for the Northeastern States. Part II. Flowers. (Also Reprint.)
 Courses in School-Supervised Gardening for the Northeastern States. (Also Reprint.)
 Lessons in School Supervised Gardening for the Southeastern States.
 Home Gardening for City Children of the Fifth, Sixth, and Seventh Grades. (Also Reprint.)
 A Manual of School Supervised Gardening for the Western States.
 School Garden Army Leaflet No. 1, Home Gardening for Town Children.
 Northeastern States Leaflet No. 96, School Supervised Gardening in a City School System.
 Broadside—The Garden Lady's Stories No. 2.
 Broadside—The Garden Lady's Stories No. 3.
 Broadside—The School Garden Army in 1920. (Also Reprint.)
 Broadside—Lessons in Gardening and Floriculture.
 Broadside—Little Girl—Big Boy.
 Broadside—Be Sure You're Right, Then Hoe Ahead.
 Broadside—Dame Ladybird and Her Friends.
 School Garden Army Certificates.
 Individual Garden Report Forms.

EXTENSION LEAFLETS.

- No. 1. Educational Institutions equipped with Motion Picture Projection Machines.

MISCELLANEOUS PUBLICATIONS.

- Available Publications of U. S. Bureau of Education, August, 1919.
 Available Publications of U. S. Bureau of Education, December, 1919.
 Available Publications of U. S. Bureau of Education, April, 1920.

Flag Exercises for the Schools of the Nation. (Reprint.)

Bulletin—Education for the Establishment of Democracy, P. P. Claxton.

Broadside—Why Children Cannot Develop, etc.

UNFINISHED PRINTING.

The following were in the hands of the printer at the close of the year:

BULLETINS.

Natural Science Teaching in Great Britain.

Private Commercial and Business Schools, 1917-18.

Nurse Training Schools, 1918.

Normal Schools, 1917-18.

The Eyesight of School Children.

The University Extension Movement.

Development of Agricultural Instruction in Secondary Schools.

Administration and Supervision of Village Schools.

Biennial Survey of Education, 1916-1918. (Vols. 1-2.)

The Feasibility of Consolidating the Schools of Mount Joy Township, Adams County, Pa.

Agricultural and Mechanical Colleges.

Requirements for the Bachelor's Degree.

Correspondence Study in Universities and Colleges.

Monthly Record of Current Educational Publications, June, 1920.

TEACHERS' LEAFLETS.

No. 7. Recreation and Rural Health.

HEALTH EDUCATION SERIES.

No. 7. The Lunch Hour at School.

Health Education Publications. (Price List.)

READING COURSES.

No. 13. The Call of Blue Waters.

No. 14. Iron and Steel.

No. 15. Shipbuilding.

No. 16. Machine-Shop Work.

EXTENSION LEAFLETS.

No. 2. Motion Picture Films of Educational Value in the Possession of Associations and Commercial and Manufacturing Companies.

NEED OF LARGER APPROPRIATIONS.

There is urgent need of much larger appropriations to the bureau.

1. To enable it to do more effectively and satisfactorily the work which it now undertakes to do. In no department has the bureau ever been able to do its work satisfactorily. In every department there is need for more expert specialists, more clerical help, more money for paying part-time help by persons actively engaged in educational work elsewhere and whose advice and counsel would be

of great value to the specialists in the bureau, for travel, and for printing.

2. To enable it to extend its work into fields in which it now does nothing except incidentally. In many important phases of education in which school officers and teachers in all the States need information, advice, and other help this bureau has no means of rendering any adequate service. Some of these are indicated in the recommendations which follow, and there are still others of scarcely less importance.

3. To enable it to bring into its expert service men and women of the best ability and to keep them until and after they have gained the power and skill which can come only through familiarity with the work of the office. Most of the work of the bureau is valuable only when it is done in such way as only such ability and such skill make possible. Much of it is of such nature that it had better not be done at all unless it can be done well. The value of the results of the hundreds of millions of dollars expended for the support of rural and urban schools of all kinds and grades, for the preparation of teachers, and for all forms of higher education depend largely on the advice and counsel of specialists in this bureau. It is therefore of the utmost importance that this advice and counsel shall be wise and sane. The maximum salary that can now be paid to any specialist in the bureau is \$3,500, and for some it is less—\$3,000, \$2,500, and \$1,800. Always inadequate, these salaries are doubly inadequate now. As a result specialists whose work can be taken up by others only with a great loss, even when competent persons can be found to take their places, are constantly leaving for much higher pay. Within the last two years a number of the ablest and most efficient of these specialists have left to accept positions in other departments of the Government service or elsewhere at salaries ranging from 20 to 150 per cent larger than they were paid here. Some of the places made vacant by their resignations are still unfilled.

RECOMMENDATIONS.

1. An increase in salaries of chief clerk, editor, statistician, collector and compiler of statistics, specialists in land-grant college statistics, schools systems, foreign-school systems, and higher education. The duties of these statutory positions require the services of men and women of such native ability, education, and experience as enable them to demand much larger salaries elsewhere. The removal of the limit of salaries that may be paid from lump-sum appropriations and such increases in the amounts of these appropriations as will enable the bureau to employ a sufficient number of specialists fitted by ability, education, and experience to do effectively the work for which

these appropriations are made. Under the present conditions this is wholly impossible.

2. An assistant commissioner and an executive secretary at salaries large enough to obtain competent persons in both places. The duties of his office make it necessary for the commissioner to visit distant parts of the country and to be absent from the office frequently many days at a time, and the details of the work of the office of the commissioner have increased to such an extent that he has little time for the more important work of formulating policies of the bureau and performing the more important duties which can not be performed by assistants. The commissioner is also a member of the Federal Board for Vocational Education, and the duties of this position require much of his time. There should be an assistant commissioner to carry on the work in the office during the absence of the commissioner and to relieve him of much of the routine of office work, and an executive secretary for the performance of the ordinary secretarial duties necessary to permit the commissioner to do his work effectively.

3. An assistant editor. The editorial work of the office has increased more than tenfold within the last 10 years and it is now wholly impossible for one editor to perform satisfactorily all the required editorial work. The more careful editing of the publications of the bureau which this addition to the editorial staff would make possible would save each year in the cost of printing much more than the salary of an assistant editor.

4. A specialist in foreign and domestic systems of education and an assistant in foreign systems of education. This bureau undertakes to keep the people of the United States informed as to all important progress in education and in methods of teaching in all countries of the world. The radical changes in education in most countries following the war make it imperative that this work be done thoroughly and well; if it is not, the educational interests of this country will suffer great and irreparable loss. It can not be so done without the additional assistants recommended.

5. This bureau has recently worked out a plan by which it may collect its statistics of education in the several States in cooperation with the education offices of these States in such way as to make them more uniform and otherwise more valuable, but experience is showing that this plan can not be operated effectively until this bureau is able to give the State offices such help as it can not now give but could give through the assistants recommended.

6. A comparatively large increase in the number of clerks, stenographers, copyists, laborers, and messengers to do the work of the bureau as it is now organized, and a still larger increase to do such

additional work of this nature as may be made necessary by the enlargements provided in the estimates to be submitted to Congress.

7. An appropriation of \$5,000 to equip the bureau with modern labor-saving devices, particularly in the statistical division. For want of such devices the clerical work of the bureau is greatly retarded and can be done at all only at unnecessary expense.

8. An increase of appropriation for traveling expenses for the commissioner and employees acting under his direction. This is necessary to enable them to make original investigations in education in the different parts of the country and to disseminate information by meeting with educational associations and other societies interested in education. Without funds sufficient to pay necessary traveling expenses, the bureau can not do its work effectively and must constantly be open to the charge of giving help where expenses can be paid rather than where help is most needed. The act establishing the bureau requires that it disseminate information in regard to education and that it assist the States in the establishment of better school systems. Both these, as well as the investigations necessary for the acquiring of knowledge of education, require the frequent presence of the commissioner and other members of the bureau in all parts of the country. The current appropriation of \$7,500 for travel and subsistence is wholly inadequate.

9. For printing the reports, bulletins, circulars, and journals which should issue from the bureau each year there should be available not less than \$125,000. The growing importance of education in our national life, the large expenditures for schools and other agencies of education, the increasing extension and differentiation of education to meet the new and increasing needs of industrial and civic life have created a demand for such information as is contained in these publications in many and widely varied fields of education. From no other source can this demand be supplied than from this bureau, and from this bureau it should be supplied fully. This requires the printing of a larger number of bulletins each year, and many of these should be printed in much larger editions than is now permitted by law. Fifty or a hundred thousand school officers can not be supplied from an edition of 12,500 copies of a bulletin on a subject in which they are all equally interested. The law should be so amended as to permit issuing bulletins in such numbers as in the judgment of the Secretary of the Interior may be needed.

10. Additional specialists in higher education, including education in universities, colleges, schools of technology, schools of professional education, and normal schools. The constant and increasing demands from these schools for the help of the bureau in making surveys and for advice as to their reconstruction and better coordination are larger and far more numerous than the bureau can meet with its

present force. There is special need of an able man, familiar with agricultural education and the problems of Negro education in the South, to devote his entire time and attention to the colleges of agriculture for Negroes in the Southern States. Such a man might easily enable the schools to make much better use of the million and a half dollars which they expend annually, \$282,121 of which comes from Federal appropriation.

11. The restoration of the appropriation for the promotion of school-directed home gardening. The proper education of many millions of children, and even the possibility of their attending school at all during the years in which attendance at school is most valuable, depend to a very large extent upon the general adoption of this work in the schools of cities, towns, and industrial villages. The enactment of child-labor laws prohibiting the employment of children under 14 years of age in mills, mines, and quarries, and the better understanding of the needs of child life tend to emphasize the importance of this work as a substitute both for unsuitable forms of labor and for idleness which results from the prohibition of employing children in these occupations. Results obtained through school-directed home gardening confirm the belief that both economically and educationally this is one of the very best and most valuable forms of employment for children between the ages of 8 and 14 or 15 years. Last year more than two million children in urban communities cultivated home gardens under the direction of the schools and produced many million dollars' worth of vegetables to be consumed where produced without cost of transportation or loss in handling; but the educational value to the children is much more important than the money value of the crops produced. In many cities, towns, and villages school-directed home gardening is now regarded as an integral part of school work. This has been brought about almost wholly by the work of the school and home garden division of this bureau, established in 1914 and discontinued because of lack of appropriation at the end of the last fiscal year. A small appropriation of thirty or thirty-five thousand dollars a year for a few years longer would enable the bureau to extend this work to a very large majority of all urban communities, thus enriching the educational lives of the boys and girls of these communities by an element otherwise impossible.

12. An increase in the number of specialists and assistants in rural education and industrial education. The few specialists now employed in these subjects are wholly unable to do more than a small part of the work needed. States are asking for expert advice in regard to school legislation and the improvement of their school systems. States, counties, and local communities want comprehensive and detailed school surveys. There is need and demand for

such general and authoritative studies of school administration, courses of study, methods of teaching, and adaptation of the work of the schools to the life and needs of the communities which they serve as can be made effective only by a large group of men and women of the best ability working under the direction of the Federal Government. Notwithstanding the many efforts made for the improvement of rural schools in all or most of the States, they still constitute the most unsatisfactory part of our public-school systems, and everything possible should be done for the creation of a strong and sound sentiment for their improvement and to advise and help State departments of education, county school officers, and teachers in this part of their work. The passage of the Federal vocation act—the so-called Smith-Hughes Act—and the creation of the Federal Board for Vocational Education relieves the Bureau of Education to a certain extent of responsibility in regard to vocational education in certain classes of schools and for certain classes of persons, but at the same time it emphasizes the importance of the work which the bureau should do for vocational education in other schools and for other classes of persons and adds in large measure to its responsibilities in regard to these subjects.

13. The addition of two or three specialists to the division of commercial education for the investigation of problems of commercial education and to assist in making plans and finding means for the preparation of our young people for participation in the larger commercial life upon which the country is now entering. The rapidly expanding commerce of the United States makes the needs of this division still more pressing.

14. More adequate provision for teaching health, for the promotion of school sanitation and hygiene, and the physical education and development of pupils. More than 20,000,000 children spend a good part of their time each year in public and private schools in the United States. They come to these schools that they may gain preparation and strength for life. In many of the schools the heating, lighting, ventilation, and other means of sanitation are so poor that instead of gaining strength for life they have the seeds of disease and death sown in their systems. In many other schools the children lose a very large per cent of that which they might gain with a better regimen. From State, county, and city school officers, in all parts of the country, thousands of requests come to the bureau for information and advice in regard to these matters. The bureau should be able to give accurate information and sound advice regarding various phases of this subject. The establishment of health and right health habits and the best types of physical education must be considered most important and vital factors in any education that is to fit for life. Proper instruction in health and provision for such

games, plays, drills, and other exercises as will develop physical strength, bodily control, and endurance are essential to the schools of any nation that would maintain for all its citizens a high degree of preparedness for the duties both of peace and war.

15. The addition of several specialists and assistants in the division of city school administration for the investigation of problems of education and school administration in cities and towns. The drift of population to cities and towns continues, and the proportion of urban population to rural population is increasing rapidly. One-half of the children of the United States now live in cities, towns, and densely populated suburban communities. In some sections of the country a very large proportion of these children are the children of foreign-born parents. All this adds to the complexity and difficulty of the problems of city-school administration, especially in the larger cities. Many hundreds of requests for advice and information in regard to these problems come to the bureau every year. Within the last few years requests have come to the bureau for comprehensive educational surveys in scores of cities, and many other cities have appealed to other agencies for work of this kind because their superintendents and boards of education knew that this bureau was not equipped as it should be to do this work. Since the war the requests from city-school officers for help of this kind have increased in great numbers. If the right education of 12,000,000 city children is a matter of interest to the Nation as a whole, then this bureau should be enabled to do effectively those things which no other agency can do to assist the school officers and teachers of these cities in making the work of their schools more effective.

16. The establishment of a division with specialists and assistants for the investigation of the education of exceptional children. There are in the United States more than 2,000,000 children whose education requires means varying widely from those in common use for the education of normal children. This includes subnormal children, the deaf, the blind, the crippled, the incorrigible, the diseased, and those whose superiority, general or specific, makes it desirable that they be given special opportunities in particular subjects or for general promotion. These children are to be found in cities, towns, and rural communities alike, and all school officers and teachers have to deal with them. Results of recent studies now make it possible to deal with the education of these children much more wisely than we did. This bureau should be enabled to bring these results effectively to the attention of school officers and to assist school officers and teachers in embodying them properly in educational programs and applying them in their daily school work. It should also be enabled to promote the continuation of studies of this kind.

17. An appropriation to enable the bureau to promote the physical, mental, and moral education of children in the home and to bring about more effective cooperation of home and school in the education of children of school age. Children of the United States are in school less than 4 per cent of the time during the years of their minority. The home is the primary and fundamental educational institution. Schools and other agencies are only secondary and supplementary. If education in the home fails, no other agency can make good the failure. The cooperative arrangement with the National Congress of Mothers and Parent-Teacher Associations through which the bureau was able for several years to do this work on a small scale was discontinued at the beginning of the last fiscal year and Congress has made no appropriation for its continuation. If an appropriation is made for educational extension, as recommended elsewhere, this work may well be included under that head.

18. Provision for the investigation of the education of adult illiterates and the dissemination of information as to the best methods of teaching illiterate men and women to read and write and of extending the meager education of those who were denied the advantages of the schools in their childhood and youth. According to the census of 1910, there were in the United States more than 5,500,000 illiterate men and women and children over the age when they may be expected to make a beginning in the public schools, and there were many millions more barely able to read and write. This illiteracy is a burden to society and a menace to State and Nation. Within the past few years much interest in the removal of this burden has developed. The response to the little attention which this bureau has been able to give to this subject indicates that States, local communities, individuals, and benevolent societies are ready to cooperate heartily with the Federal Government in any reasonable plans which may be devised and presented for this purpose.

19. The work of instructing persons of foreign birth in the English language and in the geography, history, ideals, industrial requirements, and manners and customs of our country—the work generally known as Americanization—is so very important that it should be promoted, both by national and State aid. There are in the United States between thirteen and fifteen millions of persons of foreign birth. Of these approximately 5,000,000 can not read, write, or speak the English language, and approximately 2,500,000 of them can not read or write in any language. Such a large proportion of our population unassimilated constitutes a constant menace. With a sufficient appropriation to assist in paying the salaries of teachers and State and local supervisors and funds for a staff of experts under its immediate direction, the Bureau of Education could promote effectively this work of Americanization, so vitally important

to the strength and welfare of the Nation. Bills now pending in Congress would make possible effective cooperation with the States in this work of Americanization and also in the work of teaching adult illiterates of native birth. Legislation on this subject is greatly to be desired.

20. The value of stereopticon and stereoscopic slides, moving-picture films, and phonographic records in school instruction and for extension education through community organizations, women's clubs, and other societies is well established, and there is need for a central agency for the production and circulation of such slides, films, and records. The Bureau of Education, in cooperation with State and city departments of education and institutions of higher learning, might render an invaluable service in this field at small cost. The eagerness with which university-extension divisions and other educational-extension agencies have responded to the bureau's offer of cooperation in the obtaining and distribution of eight or nine million feet of films, mostly war and public-health films, indicate what might be done with an adequate appropriation for this purpose.

21. The value of and need for community organization, especially in rural communities, become constantly more apparent, and interest in the subject has extended to all parts of the country. The experience of four years has shown that such organization can be promoted most effectively by the Bureau of Education in cooperation with State departments of education. Community organizations in all school districts would be incalculably valuable for this period of reconstruction. It is, therefore, recommended that the personnel and equipment of the bureau for this work be largely increased. If the appropriation recommended for the division of educational extension in the bureau is made, this work of community organization should be included in this division.

22. The immediate establishment of a division of educational extension to resume and expand the work begun by this bureau in the last half of the fiscal year ended June 30, 1919. Interest in extension education has grown rapidly within the last few years, and results already obtained show conclusively its value. The special need for such work now and for the next few years is indicated by the following facts: (1) That of the 4,000,000 recently discharged soldiers, nearly all of whom are eager for opportunities to extend their education for vocational efficiency, for citizenship, and for general culture, few can go to college, fewer still will enter ordinary high schools, and practically all must depend on such opportunities as the educational-extension agencies may offer; (2) that millions of laboring men and women now having shorter hours and receiving larger pay than ever before are eager for opportunities for instruction, especially in things pertaining to economics, civic rights and duties, and better living;

(3) that millions of women recently enfranchised by the ratification of the nineteenth amendment to the Constitution of the United States are eager for opportunities for instruction in regard to forms of government and civic and political problems; (4) that millions of foreign-born men and women among us, both of those who have taken out citizenship papers and those who have not, although able to speak, read, and write the English language, need to be instructed in regard to the geography, history, ideals, manners, and customs and industrial and economic opportunities in this country; (5) that two and a quarter million boys and girls are every year attaining their majority and entering the ranks of active citizens with the right of suffrage at a time when the problems of active citizenship are more numerous, complex, and difficult than ever before in our history, and that few of these have had any adequate instruction in the principles of democracy and in regard to the vital problems with which they must deal. Less than one-third of them have had any high-school education and less than one-sixth have graduated from a high school. To respond effectively to the opportunities and needs for extension education thus indicated will mean much for all the economic, civic, and cultural interests of the country. Not only should Congress make an appropriation for the maintenance of a division of educational extension as herein suggested; it should also make liberal appropriations for cooperation with the States in promoting extension education in health, trades and industries, civic duties, and general culture, comparable to the appropriations now made for cooperation with the States in extension education in agriculture and home economics.

23. An annual appropriation of \$20,000 to enable the Bureau of Education to resume and enlarge its work of studying the problems of the education of Negroes in the United States and the education of backward peoples in the Territories and possessions of the United States. The adaptation of the means of education to these people involve many difficult problems to the solution of which comparatively little attention has been given, but without whose solution much of the money expended from both public and private sources for schools and for other means of their education will be lost and their development and progress greatly retarded. When an appropriation is made for the reestablishment of the division for the education of Negroes and backward peoples the man recommended in section 10 of these recommendations to give his entire time and attention to the colleges of agriculture for Negroes in the Southern States might well be attached to this division instead of to the division of higher education.

24. An appropriation of \$30,000 a year to enable the bureau to reestablish the school board service division, which has been dis-

continued because of lack of appropriation. This division gave greatly needed help to county boards of education and boards of trustees of universities, colleges, normal schools, and technical schools in finding teachers of the grade and kind that are sought from the country at large rather than from local communities. The emergency for the relief of which this division was established and maintained for more than a year is now and will remain for several years almost as great as it was before the signing of the armistice and the beginning of the return of men from the Army and of men and women from the industries connected with the war. The great industrial development following the war and the unusually high wages paid in the industries continue to attract many teachers from the schools. Even after conditions have become more normal there will still be great need for the service which only such an agency as this can render.

25. Means to enable the bureau to cooperate with schools of education in colleges and universities, with normal schools, and with city and county school systems in making important investigations and definite experiments in elementary and secondary school education under scientific control, and in providing demonstrations of the application of principles discovered. There is as much need for scientific experiments and demonstrations in education as there is for such experiments and demonstrations in agriculture and engineering. Although we are spending annually many hundreds of millions of dollars on public education, we have little accurate and definite knowledge about the value of various forms of education and methods of teaching, and we can have little more until provision is made for such scientific experiments as are here indicated. With a comparatively small amount of money the bureau might obtain the cooperation of individuals, institutions, and boards of education in making important investigations and experiments in education not otherwise possible without much larger expenditures. Estimates have been submitted for an appropriation of \$50,000 for this purpose.

26. Means to enable the Bureau of Education to cooperate with State and county school officers in establishing and maintaining model rural schools for the purpose of demonstrating the value of such forms of rural-school organization, management, courses of study, and methods of teaching as may appear to be most desirable to be incorporated in the rural schools of the several States and communities of the United States. A bill appropriating \$275,000 a year for this purpose is now pending in Congress. Its passage would, within a few years, add much to the effectiveness of the rural schools of the several States.

27. A larger appropriation to enable the Secretary of the Interior, in his discretion and under his direction, and with the advice and

cooperation of the Public Health Service, to provide for the medical and sanitary relief of the Eskimos, Aleuts, Indians, and other natives of Alaska. Careful investigations made with the cooperation of the Public Health Service some years ago showed the necessity of immediate provision for the care of the health of the natives of this Territory and for the eradication of communicable diseases now prevalent in different sections of the Territory, which, if not put under immediate control, will soon destroy the lives of many of these people and spread among the white settlers. To do what is needed will require an annual appropriation of not less than \$125,000. The appropriation for the education of natives in Alaska should be increased to not less than \$400,000 to enable the bureau to equip more fully some of the schools and to establish schools in several villages in which none have yet been established and where there are no agencies for the civilization and the care of the natives and to enable the bureau to care for and properly educate the large number of orphans whose parents died during the epidemic of influenza last fall and winter.

28. The time has come when the natives in all parts of Alaska should be assisted and directed in the establishment and development of industries of their own which will give them remunerative employment through much of the time in which they are now more or less idle, and by which they may make for themselves a better support and gradually take over the larger part of the cost of their own schools and medical attendance. The success of the reindeer industry in the northwestern part of Alaska and of cooperative stores, fish canneries, sawmills, and other industries in southeastern Alaska, show clearly the importance of such assistance. Ten thousand dollars a year judiciously expended for this purpose through the next 10 or 15 years would finally save hundreds of thousands of dollars to the Government by making these people more competent to care for their own needs.

29. For the work which the bureau now does more room is needed, and still more will be needed as its staff of experts and clerks is increased. There is need for more and better arranged space for the bureau's library, which is increasing from year to year. The Nation needs an educational museum, a kind of perpetual educational exhibit in which there may be found at any time, properly arranged and catalogued, typical courses of study, samples of school furniture, and equipment of all kinds, specimens of school work, plans and photographs of buildings and grounds, and whatever else may be helpful in enabling students of education and school officers and teachers to gain an accurate and comprehensive knowledge of purposes, methods, and results of education in this and other countries, and assist them in forming ideas for the improvement of their own

schools and school work. This museum should, of course, be under the direction of the Bureau of Education and should constitute an essential part of its equipment. The work of the Federal Board for Vocational Education, of which the Commissioner of Education is a member, is so closely related to that of this bureau that it would add to the efficiency both of the board and of the bureau if they were housed in the same building, so that they might have easy access to the same library and communicate easily with each other; and there are other important activities of the Government which could be carried on more effectively under the same conditions. I therefore renew the recommendation contained in previous statements that plans be considered at once for the erection of a building that will afford ample room for the work of the bureau and allied activities of the Government, house the bureau's library, and furnish ample room for such collections of materials as those mentioned above. It would, I believe, be entirely proper that such a building be erected as a memorial of the patriotic services rendered by the schools and their teachers and pupils during the Great War, and these teachers and children might well be permitted to contribute to the cost of the building.

Respectfully submitted.

P. P. CLAXTON, *Commissioner*.

The SECRETARY OF THE INTERIOR.



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DEPARTMENT OF THE INTERIOR

JOHN BARTON PAYNE, Secretary

UNITED STATES GEOLOGICAL SURVEY

GEORGE OTIS SMITH, Director

FORTY-FIRST ANNUAL REPORT

OF THE

DIRECTOR OF THE UNITED STATES
GEOLOGICAL SURVEY

TO THE

SECRETARY OF THE INTERIOR

FOR THE FISCAL YEAR

ENDED JUNE 30

1920



WASHINGTON

GOVERNMENT PRINTING OFFICE

1920

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FORTY-FIRST ANNUAL REPORT OF THE DIRECTOR OF THE UNITED STATES GEOLOGICAL SURVEY.

GEORGE OTIS SMITH, *Director.*

INTRODUCTION.

The appropriations for the public work under the United States Geological Survey for the fiscal year 1919-20 comprised items amounting to \$1,586,353.50.

In general the results of the varied activities of the Geological Survey may be regarded as meeting with a constantly increasing measure of public approval, as shown by the larger use that is being made of this branch of the public service. Correspondence with all classes of citizens—ranchers and corporation officials, school children and university professors, prospectors and mining engineers—has continued to increase, and this gain has been evident in the requests both for specific information and for publications. Ten years ago a telegraphic request for a map or report was a notable incident; now telegrams of this kind are of daily occurrence.

Especially gratifying has been the popular demand for topographic maps, the increase in sales this year being 70 per cent. The number of all publications—books and maps—distributed during the year exceeded the number printed this year, this disproving the common assertion that Government publications simply accumulate until they become only waste paper. Indeed, an embarrassing feature of much of the correspondence during the year has been the thousands of requests for reports that were out of print, and more reprints than usual of exhausted editions have been authorized to meet an insistent demand. The public is making use of the publications of the Geological Survey as never before.

SPECIAL TOPICS.

PLANNING FOR THE FUTURE.

One of the many official questionnaires recently inquired what part of the Geological Survey's investigations concern the future. It takes only the briefest review of the varied activities of this branch of the Government scientific service to realize that every activity is

forward-looking—that facts are being collected with which to guide present action and to plan for future action. This is true not only of a special investigation like the superpower survey just authorized, but of the collection of stream-gaging records, the making of topographic maps, the study and the estimation of mineral resources and mineral production, and even the interpretation of geologic history. The Geological Survey's function in the classification of the public lands is not simply cooperation with the General Land Office in the administration of the land laws—it is a cooperative effort to insure the best use of these lands, to plan their use so that the West may not have to pay the penalties attaching to an unwise disposition of the Nation's real estate.

The title given to a public address by the Director of the Geological Survey before the Engineers' Club of Philadelphia, "Engineering as prosperity insurance," expressed this idea of the need of larger attention to the future of our country and the part to be played by science and engineering. Federal Trade Commissioner Colver has recently added to this thought the suggestion that our care-free days of national youth have been passed; we have been spendthrifts with our patrimony and are now reaping our wild oats, but the problems of mature and responsible life are pressing hard upon us, and the need of making provision for our national old age is staring us in the face. But, however we express it, never before have legislators and executives, business men and citizens generally had greater need of exact information.

In the First Annual Report Director King outlined the future of the Geological Survey and emphasized the relation of scientific research to the development of the country's material resources. In a period of rapid expansion and exploitation he gave warning that without adequate information in the possession of the Federal Government as to the needs of industry, without scientific knowledge of all the elements of national wealth, commerce is mere transportation, industry is short-lived, and an equilibrium of population with local resources is not to be attained.

Though for 40 years the Geological Survey's policy has been to contribute to the formation of a national plan, its own outstanding need to-day is a plan for itself—a program. The recognized function of a scientific bureau is to collect and arrange facts upon which the nation may base its plans for future development, but the Geological Survey now finds itself unable to plan adequately its own development. It lacks that assurance of continued appropriations that would encourage or warrant long-term investigations, a few of which are absolutely essential in any forward-looking program of scientific research. The increasing gap between the Government scale

of professional salaries and the scale prevailing in commercial employment causes a "turnover" that makes the administration of scientific work almost hopeless. So it happens that the responsible official whose purpose is to do the work most needed actually has his choice of projects determined largely by the personnel available. For each scientist of fully tested ability the choice has to be made between several pieces of work, all of which deserve immediate attention. Even less satisfactory is the situation in which an urgent call for a field examination has to be met by assigning to it an untried worker under conditions that preclude the expectation of the best results. Thus, though there is no intentional lowering of scientific standards, the product is not wholly satisfactory.

The net result of these conditions is that the Geological Survey is not fully occupying the field which is recognized as peculiarly its own. It could, however, occupy that field. With slightly increased appropriations, and especially with a declaration of intent by Congress to regard the scientific bureau as having successfully passed its probationary period, greater stability might be expected and some progress might be made in the adoption of a program fitted to the country's needs. A program for completing the topographic map of the United States for the use of this generation was outlined in the Fortieth Annual Report (pp. 13-16), but Congress has not yet approved that plan, though it promises to get results most expeditiously and economically. The power program, also presented in the report for last year, has found more encouraging support, as the super-power survey of the eastern industrial zone has now been authorized by Congress. It is hoped that the engineering report on this survey will commend itself so highly to Congress that similar investigations of other parts of the United States may be authorized before the demand for unified electrification becomes so urgent as it has already become along the North Atlantic seaboard.

Another item in the working program whose value was foreseen but whose adoption has not been possible is the mapping of geologic structures favorable to oil accumulation in the Western States prior to the enactment of oil-leasing legislation. The need for such mapping was realized, for it would be helpful alike to the oil operator and to the Government official administering the new law, but neither men nor money have been available to do more than touch the outer edges of this project. Similar preparation for the water-power law was obviously desirable but could be made only in part.

The examination of storage sites made in 1888-1891 was pioneer work that marked a beginning in the larger utilization of the water resources of the West, and it is unfortunate that this special investigation was discontinued, for now authoritative information of this

kind would be invaluable in planning the storage of flood waters for power and irrigation in the West and for power development, improvement of navigation, and flood protection in the East. The Nation can well afford to invest in engineering data for future use. In a word, the Geological Survey, even though its shortcomings have been keenly realized from within, has not yet measured up to its task in the Nation's business.

WASTAGE IN PUBLIC SERVICE.

In too much of the current discussion of the small salaries paid by the Government the emphasis put on the injustice and hardship suffered by the employee has tended to conceal a larger issue—the great harm wrought to the public service—for during this period that has been marked by a failure to adjust salaries to living expenses the Government work may have suffered as much as the Government workers. Many employees, it is true, have continued to render services far in excess of their compensation, but many others have lost heart or have had their minds distracted by the problems of life, with consequent loss in quality of endeavor and of achievement, and the more ambitious and active, attracted by the living wage paid elsewhere, have deserted the Government service. The net result is a loss in efficiency out of all proportion to the false economy represented by the Government pay scale.

Other bureaus may have fared worse, but the losses of employees suffered by the Geological Survey make up a serious item in its failure to do needed work. A slight advance in the salary scale has been quite insufficient to check the exodus of sorely needed specialists. In the competitive market, where the Government salary is doubled, trebled, or even quadrupled by the salary offered by the corporations, the Geological Survey naturally loses men who have just reached their maximum productivity and some who are occupying key positions in its field activities. With these inroads on the working force no attempted economy, no readjustment, however skillful, can prevent a distressing wastage due to interrupted work.

In general, the men who are most desired in the public service could be retained at salaries considerably less than those paid in private employ. It is regrettable that the public service should be even temporarily set on a financial basis so narrow that the professional positions, in which the most capable workers are needed—men and women with the best training and the highest ability—can attract and retain only those who are either able to eke out their Government salaries with private income or willing to sacrifice a certain degree of comfort in living to their love for science and for country. The public servant is worthy of his hire.

WORK OF THE YEAR.

DUTIES OF THE DIRECTOR.

In earlier years the annual report contained a paragraph stating the field and office work of the Director, and Director Walcott's summary could always make reference to his personal scientific research. Field work by the present Director has been confined to inspections and visits to field parties, made largely to acquaint him better with the changing methods and standards of work. For several years even this type of field work has been discontinued, not from choice but by force of the larger volume of administrative duties in Washington.

In addition to the administrative work, the Director has devoted considerable time to the critical reading of manuscripts submitted for publication but perhaps more time to the popular presentation of the results of the varied investigations made by the Survey. The bearing of the scientific, engineering, and statistical work of the Geological Survey upon the public welfare is not fully appreciated except as the results of that work are translated into popular language and their relation to present-day issues is set forth. In part this duty is performed through attendance upon hearings before Congressional committees, but in part larger audiences must be reached at meetings of technical societies. Public addresses by the Director during the year included "Our industry's part," American Mining Congress, St. Louis, Mo., November 18, 1919; "The future of natural gas," Natural Gas Conference, Washington, D. C., January 15, 1920; "Engineering as prosperity insurance," Engineers' Club of Philadelphia, January 20, 1920; "Fluctuations in coal production—their extent and causes," with F. G. Tryon as joint author, and "A foreign oil supply for the United States," American Institute of Mining and Metallurgical Engineers, New York City, February 17, 1920; "The public-service opportunity of the oil geologist," American Association of Petroleum Geologists, Dallas, Tex., March 18, 1920; "The geographic side of geology," American Geographical Society of New York, April 6, 1920; "Industry's need of oil," American Iron and Steel Institute, New York City, May 28, 1920; and "The engineer and national prosperity," conference of Federated American Engineering Societies, Washington, D. C., June 3, 1920. At the April meeting of the American Geographical Society of New York the Charles P. Daly gold medal was awarded to the Director.

In addition to these addresses, two articles on similar subjects were published—"Where the world gets its oil," in the *National Geographic Magazine*, February, 1920; and "Minerals as essential raw materials," in the *Annals of the American Academy of Political and Social Science*, May, 1920.

PUBLICATIONS.

The publications of the year numbered 295 and consisted of 1 annual report, 9 professional papers, 3 separates from 1 professional paper, 12 bulletins, 36 separates from 8 bulletins, 15 water-supply papers, 3 separates from 1 water-supply paper, 3 volumes of Mineral Resources of the United States, 69 separates from 4 annual volumes of Mineral Resources, 2 new geologic folios, 69 new maps, a list of United States Geological Survey publications, 3 texts for topographic maps, an advance statement on zinc in 1919, 19 index-map circulars, a list of geographic folios available, 36 press bulletins, and 12 monthly lists of new publications. The total number of pages in these publications was 17,507. Brief notices of the publications in the regular series and of the new maps issued during the year are given below.

FORTIETH ANNUAL REPORT of the Director of the United States Geological Survey to the Secretary of the Interior, for the fiscal year ended June 30, 1919. 1919. 198 pages, 2 plates, 1 text figure.

A detailed account of the work of the Geological Survey during the fiscal year 1919, including reports from each branch, division, and section, abstracts of the publications of the year, and maps showing areas covered by published geologic and topographic maps. The Director outlines the readjustment of the Survey's activities in beginning a return to the regular program of scientific work, after the signing of the armistice, and emphasizes the spirit of full service displayed so universally by the members of the Survey during the war. Copies of two additional citations for the French Croix de Guerre are given. The inadequacy of Government compensation as shown by the large "turnover" in the Survey—19 per cent in each of the last two years—is illustrated graphically by a diagram showing the discrepancy between average salaries received by Survey geologists and average salaries offered by outside employers. The loss of efficiency resulting from a recent retrenchment measure, whereby the space allotted to the Survey's force has been reduced to 75 square feet each for scientist and clerk alike, is clearly set forth. A program for completing an adequate map of the whole territory of the United States by 1932 is outlined, and an indorsement of such a program by a conference of the engineering profession is quoted. The preparation of a world atlas of commercial geology, begun during the war for the benefit of the war boards, is to be continued, and the atlas will be published in parts for the information of the general public, which needs to know not only our own mineral resources but those of other countries. The report records the death of Dr. George F. Becker, the last member of the group of distinguished geologists who were associated in the organization of the United States Geological Survey in 1879. In the 40 years since that date the annual appropriations for the Survey have increased from \$106,000 to \$1,437,745 and the personnel from 39 to 967.

PROFESSIONAL PAPER 111. The ore deposits of Utah, by B. S. Butler, G. F. Loughlin, V. C. Helkes, and others. 1920. 669 pages, 57 plates, 74 text figures, 1 insert.

About 12 years ago the Geological Survey planned the preparation of a series of volumes in each of which should be described the geology and ore

deposits of a single State. The plan was to summarize and bring up to date the detailed work that had been done on individual districts, to make reconnaissance examinations of other districts, and to extend knowledge of the general geology of the State sufficiently to provide an adequate setting for the descriptions of the mining districts. The first volume of this series, Professional Paper 68, on New Mexico, appeared in 1910; the second volume is Professional Paper 111, just issued. Utah far surpasses New Mexico in the development and output of its mines and the mineralogic variety of its ores, and it contains a large number of minor districts concerning which little geologic information has hitherto been available. For these reasons the present volume is necessarily rather bulky, but it constitutes a valuable reference work containing much information that can not be found elsewhere. An interesting result which has come from the general survey of all the known ore deposits of the State is the generalization by Mr. Butler that the occurrence of ore bodies around an intrusive rock, within depths accessible to mining, depends upon the vertical distance between the present erosion surface and the original top or apex of the igneous mass. The production of metals on a commercial scale in Utah began in 1865; 50 years later the annual output of metallic ore had reached 10,000,000 tons, valued at \$55,000,000, and in 1917 it was 15,000,000 tons, valued at \$99,000,000. The paper contains an extensive bibliography and is elaborately illustrated. A brief appendix describes and figures some Carboniferous and Triassic fossils that occur in Utah, with the purpose of aiding the geologist to discriminate and identify the rock groups that he is called upon to investigate.

PROFESSIONAL PAPER 112. Upper Cretaceous floras of the eastern Gulf region in Tennessee, Mississippi, Alabama, and Georgia, by E. W. Berry. 1919. 177 pages, 33 plates, 12 text figures.

The area of outcrop of the Upper Cretaceous deposits in the eastern Gulf region borders the inland margin of the Coastal Plain, and the belt from which determinable plant fossils have been collected extends from west-central Tennessee southward and eastward to west-central Georgia. Most of the plants come from the basal formation of the Upper Cretaceous series—the Tuscaloosa formation. As the geologic work of the author of this paper and his associates in this area was of a reconnaissance nature only, the paper is regarded simply as a preliminary report, though it fully describes the extensive collections that have so far been obtained. The Tuscaloosa formation contains abundant deposits of workable clays, and the economic development of these clays will probably lead to the discovery of additional representatives of the flora. The collections described comprise nearly 200 species from 23 localities. The paper is illustrated with geologic sections at the plant localities and views of the plant-bearing beds in addition to the plates showing the fossils.

PROFESSIONAL PAPER 113. Iron-depositing bacteria and their geologic relations, by E. C. Harder. 1919. 89 pages, 12 plates, 14 text figures.

The investigations of Pasteur disclosed the deadly power of bacteria in disease and their great efficiency in processes of fermentation and decay. Realization of the influence of bacteria in affecting the character and fertility of soils, in bringing about rock decay, and in producing other geologic results has come more slowly. As early as 1836, however, it was found that certain bacteria have the power of withdrawing iron from solution and causing its precipitation as ferric hydroxide. Since that time these organisms have been studied by many investigators, but they have ap-

proached the subject with the biologist's point of view and have given only minor consideration to its geologic significance. Mr. Harder has for a number of years been engaged in a study of iron ores in different parts of the world and has paid special attention to the origin of the deposits. In an investigation of the Cuyuna iron range of Minnesota he found an opportunity in the laboratories of the University of Wisconsin to study the iron-depositing bacteria, and this paper presents the results of that research. Mr. Harder found that in addition to the iron-depositing bacteria proper probably many of the common bacteria of soil and water are active in the precipitation of iron compounds. This result is believed to be new. The report contains a valuable critical summary of previous work on this subject and should serve a useful purpose in bringing before geologists a digest of practically all that is known of it, supplemented by a carefully prepared bibliography. The book is well illustrated with photomicrographs and other views of the bacteria.

PROFESSIONAL PAPER 115. The copper deposits of Ray and Miami, Ariz., by F. L. Ransome, 1919. 188 pages, 54 plates, 20 text figures.

The Ray and Miami districts, in central Arizona, have yielded over a billion pounds of copper since 1907, when the low-grade ores of these districts were first successfully exploited on a large scale, and the three principal mining companies have declared dividends amounting to \$68,000,000. The copper ores are due to the intrusion, probably in Tertiary time, of great masses of granite and allied rocks, some of which are several miles in diameter, followed by downward enrichment. The ore-depositing solutions that accompanied the intrusive granitic material penetrated the rocks through a multitude of small irregular fissures, which were doubtless a consequence of the intrusion and solidification of the granite. The deposits thus formed were later enriched by the agency of downward-percolating atmospheric water. The author concludes that the greater part of the enrichment was effected before the eruption of the dacite of the region, which he assigns to late Tertiary time, and thus, of course, before the deposition of the still later Gila conglomerate. This conclusion suggests the possibility that other ore deposits may yet be discovered beneath certain areas of the conglomerate. Estimates based on drilling and mining place the total ore originally present in the two districts at 260,000,000 tons. The copper tenor of the ore mined averages between 1.5 and 2 per cent. This paper is a characteristic example of the Survey's detailed reports on individual mining districts. It gives a sketch of the physical geography of the region, an elaborate description of the geology in general and in detail for each district, a concise account of mines and mining methods, and full discussions of the mineralogy, geologic relations, and origin of the ore deposits. The report is well illustrated with geologic maps, sections, mine plans, and views, and contains a glossary of the more technical terms used.

PROFESSIONAL PAPER 116. The Sunset-Midway oil field, Calif., Part I, Geology and oil resources, by R. W. Pack. 1920. 175 pages, 45 plates, 15 text figures.

Although the petroleum deposits of the United States are wonderfully rich and a vast quantity of oil remains to be taken from them, they are by no means inexhaustible, and if the next generation is not to feel the pinch of the dwindling supply it is essential that the present generation so utilize these deposits as to permit the least possible waste. The search for new oil pools is now occupying the full attention of most of the petroleum geologists of the country and will become increasingly keen as the demand for oil

increases, but the geologist will in the future render his chief service to the petroleum industry through intensive studies of the productive fields, made for the purpose of aiding in the efficient extraction of the oil. The proper interpretation of the well records and the correlation of these data with the areal geology depend upon the geologist, and his work should afford the comprehensive picture of the underground conditions that is so essential to the petroleum operator. During the last 18 years the United States Geological Survey has been investigating the petroleum resources of California and has examined both productive and prospective fields. The results of much of this work have been set forth in published reports, some preliminary and others more detailed. The report on the Sunset-Midway field now published consists of two parts, of which the second (Professional Paper 117) is noticed below. The present paper constitutes the first part of the report. It describes the geology of the general region of which the productive areas form a small part, and into this setting are fitted the details of the geology of the productive areas as derived chiefly from a study of the well records. The interpretation of the geologic conditions is not presented as a completed picture, accurate in all details, but as a framework into which may be set other data that become available from time to time, and it should thus serve in the guidance of future work. The Sunset-Midway field is in the western part of Kern County, about 40 miles southwest of Bakersfield. Its active development began in 1900, and it has produced over 2,850,000,000 barrels of oil. This report gives a large amount of detail and is profusely illustrated with maps, sections, and views.

PROFESSIONAL PAPER 117. The Sunset-Midway oil field, California, Part II, Geochemical relations of the oil, gas, and water, by G. S. Rogers. 1919. 100 pages, 2 plates, 8 text figures.

Contains analyses of the oil and gas and the oil-field waters at the Sunset-Midway field and a discussion of their composition in relation to their geologic occurrence, some figures on the geothermal gradient, and a brief study of the invasion of the oil sands by water. California petroleum differs in many important respects from the varieties produced in other parts of the United States and has been much studied by chemists. This paper gives a large amount of information bearing on the geochemical character of the oil and its relations to the accompanying gas and water. The author also discusses the probable changes that the oil and gas have undergone in the course of their migration. The paper contains two maps and several diagrams.

PROFESSIONAL PAPER 118. Some American Jurassic ammonites of the genera *Quenstedticeras*, *Cardioceras*, and *Amoeboceras*, family Cardioceratidae, by J. B. Reeside, jr. 62 pages, 24 plates, 1 text figure.

Describes and figures 33 species and 2 varieties of Jurassic ammonites. Of these forms 30 have not been previously described. The new species were obtained mainly from the Sundance formation of Wyoming, but the interpretation of the data furnished by the study of these fossils has been hindered somewhat because the exact stratigraphic location of much of the material is unknown. However, a knowledge of the general relationship of these forms to those of other areas, as here set forth, is in itself of value to the stratigrapher and systematist.

PROFESSIONAL PAPER 119. Reptilian faunas of the Torrejon, Puerco, and underlying Upper Cretaceous formations of San Juan County, N. Mex., by C. W. Gilmore. 70 pages, 26 plates, 33 text figures.

The collection of vertebrate fossils described in this paper is especially rich in turtle remains, which in the large number of specimens and the excellent state of their preservation constitute the best single collection of fossil turtles that has ever been made in the southwestern United States. The recovery of nearly perfect individuals of several genera hitherto known only from very fragmentary materials forms a distinct contribution to our knowledge of the skeletal anatomy of these extinct turtles, and the acquisition of good specimens representing species of the same genera from successive geologic formations affords data for study of the structural changes that may have taken place in a genus over considerable periods of time. The paper describes 29 species of turtles, of which 16 are new; also a number of fragmentary dinosaur remains.

PROFESSIONAL PAPER 120. Shorter contributions to general geology, 1918; David White, chief geologist. 1919. 208 pages, 30 plates, 19 text figures.

Contains nine papers by ten authors. These papers had previously been published separately and were noticed in the Thirty-ninth and Fortieth annual reports.

PROFESSIONAL PAPER 125-A. An Eocene flora from trans-Pecos Texas, by E. W. Berry. 1919. Pp. 1-9, Pls. I-III, figs. 1-2.

Describes a small collection of fossil plants obtained in the Barilla Mountains, about 15 miles south of Toyahvale, near the line between Reeves and Jeff Davis counties, Tex. Although the collection contains only a few species it has enabled the author to assign a definite age to the beginning of igneous activity in this region and to establish correlations between the floras of the Mississippi embayment and the Rocky Mountains.

PROFESSIONAL PAPER 125-B. Gradations from continental to marine conditions of deposition in central Montana during the Eagle and Judith River epochs, by C. F. Bowen. 1919. Pp. 11-21, Pl. IV.

An area of about 1,200 square miles in Rosebud and Dawson counties, Mont., heretofore geologically unexplored, was recently studied and mapped by Mr. Bowen and found to be of considerable geologic interest. Changes in the character of sediments from sandstone to shale and from fresh-water to marine deposits imply corresponding changes in physiographic conditions during their accumulation and therefore furnish a basis for the interpretation of the past history of the region in which they are found. Such changes occurred in north-central Montana during the Upper Cretaceous epoch. Mr. Bowen's studies have shown that, although eastern Montana remained beneath the sea throughout most of Upper Cretaceous time, in the central part of the State, at least as far west as the front of the Rocky Mountains, there were oscillations of land and sea level produced either by rhythmic gentle depressions of the sea floor or by uplifts of the land mass to the west. These changes are recorded in the rocks of the region.

PROFESSIONAL PAPER 125-C. Pliocene and Pleistocene fossils from the Arctic coast of Alaska and the auriferous beaches of Nome, Norton Sound, Alaska, by W. H. Dall. 1920. Pp. 23-37, Pls. V-VI.

Discusses the geology of the fossiliferous Pliocene and Pleistocene deposits of the Arctic coast and the Nome region and describes 20 or more new species. Outlines the bearing of the geologic data on the theories relating to the immigration of Asiatic land animals into America.

BULLETIN 666. Our mineral supplies; H. D. McCaskey and E. F. Burchard, geologists in charge. 1919. 266 pages, 1 plate, 6 text figures.

In September, 1914, soon after the beginning of the war in Europe, the Director of the United States Geological Survey summarized the mineral

reserves of this country and offered certain suggestions as to making America industrially independent. At that time it was clearly recognized that the United States would soon face unusual conditions resulting from the depletion or exhaustion of our stocks of imported minerals. As the war progressed and ocean commerce became more unsettled, the difficulty of obtaining supplies of certain minerals increased, and the Geological Survey was called upon for an ever-increasing amount of information and advice concerning these minerals, and also concerning the commercial situation with respect to other more plentiful minerals and their derivatives. In order to meet this demand with published information the series of papers now assembled in a single volume was prepared by the members of the Survey staff who were most familiar with the minerals required. The first of these papers was issued April 13, 1917, one week after the United States entered the war, and all but two of the chapters were available in 1917. The complete volume contains an introduction, a bibliography, and 32 papers on mineral supplies. The introduction, which has not been issued separately, includes tables showing domestic mineral supplies in three classes—(1) adequate to all probable peace and war needs; (2) sufficient for a large part of peace and war needs; and (3) chiefly inadequate in quantity or quality or both for peace and war needs.

BULLETIN 678. Clays and shales of Minnesota, by F. F. Grout, with contributions by E. K. Soper. 1919. 256 pages, 16 plates, 38 text figures.

A discussion of the distribution, origin, properties, classification, and adaptability of the clays and shales of Minnesota. The general object of the work has been to assist in the development of the clay resources of the State. The investigation covered the brick supply for every town of 1,000 or more inhabitants and for every county in the State and included surveys of deposits that are now developed at only a few places, a search for new deposits, and a determination of the qualities of these deposits and of certain mixtures so as to ascertain their suitability for refractory wares, pottery, paving brick, and other high-grade products. The detailed results of the tests are arranged by counties, so that anyone interested in the resources of a particular locality can easily find the data referring to them. The investigation was made in cooperation with the Minnesota Geological Survey and is an excellent example of cooperative geologic work of great practical utility. The report contains a section on the technology of clay, with explanations of technical terms and recommendation of processes for experiments. It also recommends certain areas for prospecting and development and makes suggestions as to the possibility of utilizing some of the clays for products of higher grade and consequently greater value than common brick. It shows that the Minnesota products are not inferior to those now brought into the State in large quantities from Wisconsin, Iowa, and Illinois at unnecessarily high prices. The broader problems of ceramics are treated only incidentally, but some of the important scientific conclusions of the American Ceramic Society, the Bureau of Standards, and other State surveys are briefly reviewed. A more extended discussion of the scientific results of the investigation is to be published later. The book is well illustrated with halftone views, diagrams, sketches, maps, and geologic sections.

BULLETIN 686. Structure and oil and gas resources of the Osage Reservation, Oklahoma. Advance chapters as follows:

686-S. T. 24 N., Rs. 11 and 12 E., by O. B. Hopkins and Sidney Powers. 1919. Pp. 237-253, Pls. XXXVII-XL, fig. 1s.

686—T. T. 27 N., R. 11 E., by H. M. Robinson and R. V. A. Mills. 1919. Pp. 255-277, Pls. XLI-XLII, figs. 41-43.

686—U. Tps. 21-23 N., Rs. 6-7 E., and Tps. 23-25 N., Rs. 3-5 E., by C. F. Bowen, P. V. Roundy, C. S. Ross, and Frank Reeves. 1919. Pp. 279-301, Pls. XLIII-XLV, fig. 1u.

686—V. T. 27 N., R. 10 E., by H. M. Robinson and R. V. A. Mills. 1919. Pp. 303-327, Pls. XLVI-XLVIII, figs. 44-45.

Four additional pamphlets in the series on the Osage Reservation. Each one contains a map showing the geologic structure of the area discussed.

BULLETIN 691. Contributions to economic geology (short papers and preliminary reports) 1918, Part II, Mineral fuels; David White, G. H. Ashley, and M. R. Campbell, geologists in charge. 1919. 361 pages, 44 plates, and 45 text figures.

Contains 14 papers by 13 authors. These papers had previously been published separately and were noticed in the Thirty-ninth and Fortieth annual reports.

BULLETIN 692—B. Water-power investigations and mining developments in southeastern Alaska, papers by G. H. Canfield, Theodore Chaplin, and R. M. Overbeck. 1919. Pp. 43-136, Pls. I-II.

BULLETIN 692—D. Mining and mineral deposits in the Cook Inlet-Susitna region, Alaska, papers by S. R. Capps, J. B. Mertie, jr., and G. C. Martin. 1919. Pp. 177-282, Pls. IV-VI, figs. 3-6.

BULLETIN 692—E. Sulphur deposits and beach placers of southwestern Alaska, by A. G. Maddren. 1919. Pp. 283-319, Pls. VII-VIII, figs. 7-12.

BULLETIN 692—F. Mining in the Fairbanks, Ruby, Hot Springs, and Tolstoi districts, Alaska, papers by Theodore Chaplin and G. L. Harrington. 1919. Pp. 321-351, Pl. IX, fig. 13.

BULLETIN 692—G. Mineral resources of Seward Peninsula, Alaska, by G. L. Harrington. 1919. Pp. 353-400, Pl. X.

Five chapters of the annual progress report on investigations in Alaska for 1917, including a number of short papers on the areas indicated in the titles.

BULLETIN 692. Mineral resources of Alaska; report on progress of investigations in 1917, by G. C. Martin and others. 1919. 420 pages, 10 plates, 13 text figures.

The fourteenth of a series of annual bulletins treating of the mining industry of Alaska and summarizing the results achieved during the year 1917 in the investigation of the mineral resources of the Territory. Contains statistics of mineral production, notes on the progress of the mining industry, and preliminary reports on investigations made by the Geological Survey. Includes 25 papers by 9 authors, also a list of recent Survey publications on Alaska. These papers, grouped according to regions covered, were published in 7 separate chapters in 1918 and 1919.

BULLETIN 694. Bibliography of the metals of the platinum group—osmium, platinum, palladium, iridium, rhodium, ruthenium—1748-1917, by James Lewis Howe and H. C. Holtz. 1919. 555 pages.

The first edition of this bibliography, by Dr. Howe, was published in 1897 as a volume of the Smithsonian Miscellaneous Collections and gave a list of the articles on the metals of the platinum group found in scientific literature to the end of 1896. A supplement to this edition, prepared by Dr. H. C. Holtz, of Amsterdam, brought the record down to 1910 but was never published. Dr. Howe received from a Paris friend the manuscript of this supplement and has filled its gaps, and brought the record down to the

end of 1917. It was his aim to make the record of the chemistry of these metals as complete as possible, but several other divisions of the subject have not been followed beyond the earlier references. The book is printed in large, easily readable type and contains an author index and a subject index.

BULLETIN 695. The data of geochemistry (fourth edition), by F. W. Clarke. 1920. 829 pages.

Most of the rocks that form the crust of the earth consist of aggregates of mineral species, which in turn are in the main compounds of two or more chemical elements. The reactions that took place during the formation of the rocks were strivings toward chemical equilibrium, and the final result was a maximum of stability under existing conditions. All rocks are subject to the action of various agencies which bring about chemical changes. Every such change implies a disturbance of equilibrium and eventually a reestablishment of the maximum possible stability under the new conditions. The study of these changes is the province of geochemistry. To determine what changes are possible and how and when they occur, to observe the phenomena that attend them, and to note their final results are the functions of the geochemist. The literature on geochemistry is vast, but widely scattered and in part difficult of access. To bring some of the data together, to formulate a few of the problems, and to present certain general conclusions in their modern form are the purposes of this memoir. The present volume is the fourth edition of this work, of which the first edition was published in 1908. The text has been revised and enlarged for this edition. The book has an exceptionally complete index and is of great value to all students of geology and chemistry.

BULLETIN 696. A catalogue of the Mesozoic and Cenozoic plants of North America, by F. H. Knowlton. 1919. 815 pages.

An expansion of the author's "Catalogue of the Cretaceous and Tertiary plants of North America," published in 1898. In the 20 years since that bulletin was issued there has been great activity in North American paleobotany and the number of described species has been nearly doubled. The scope of the catalogue has been extended to include the whole of the Mesozoic as well as the Cenozoic plants, but it does not cover Greenland and Mexico. For each genus, each American form that is known only in a fossil state, and each Old World form that is recognized in North American strata, the original date and place of publication are given, followed by all or the most important references. For each living species that has also been found in a fossil state only the authority is given, followed by references to the fossil occurrences. The synonymy is placed under the species to which it belongs, but each synonym is also entered in its alphabetic place, with a cross reference. Besides the catalogue, which covers 618 pages, the book contains a correlation table showing the approximate position of the plant-bearing beds, a biologic classification of the genera, with index, and separate alphabetic lists of the genera and species occurring in each formational unit.

BULLETIN 698. Bibliography of North American geology for 1918, with subject index, by J. M. Nickles. 1919. 145 pages.

A list, arranged alphabetically by authors' names, of publications on the geology of the continent of North America and adjacent islands, also Panama and the Hawaiian Islands, issued in 1918. The book is indexed and contains lists of chemical analyses reported and of minerals, rocks, and geologic formations described.

BULLETIN 699. The Porcupine gold-placer district, Alaska, by H. M. Eakin. 1919. 28 pages, 8 plates.

The Porcupine gold-placer district lies in the headwater region of Chilkat River, near the British Columbia boundary, about 100 miles northwest of Juneau, or 25 miles west of Skagway. Productive mining began here in 1899 and continued so successfully that the district has ranged as one of the most important placer fields in Alaska. This district was visited by Geological Survey parties in 1899, 1903, and 1916, and the present bulletin gives a summary of the knowledge thus obtained. It includes a geologic map and several views of the district. The total output to the end of 1916 is estimated at \$1,200,000.

BULLETIN 700. The analysis of silicate and carbonate rocks, by W. F. Hillebrand. 1919. 283 pages.

The fourth edition of Dr. Hillebrand's treatise on rock analysis, previous editions of which were published as Bulletins 176, 305, and 422. In the nine years since the appearance of Bulletin 422 many new methods and modifications of methods of rock analysis have been published, and such of these as are certainly or probably valuable are described in the present edition. The earlier text has also been extensively revised, and this bulletin shows many changes and additions, with some omissions. This book is a standard manual of rock analysis and has been translated and republished abroad.

BULLETIN 701. Geothermal data of the United States, including many original determinations of underground temperature, by N. H. Darton. 1920. 97 pages, 1 plate, 3 text figures.

Presents all available published data bearing on the rate of increase of underground temperature with increasing depth in the United States, together with several hundred original observations by the writer and his associates. The principal feature brought out by these data is the fact that the geothermal gradient varies widely from place to place, though probably subject to certain regional relations. A few similar compilations have been previously published, with attempts to show the relation of temperature increases to many underground factors, such as variation in conductivity of rocks, volcanic influences, and movement of underground water, but extended special investigations must be made before the weight of such factors can be adequately determined. This bulletin records observations made in 39 States. The deepest observation, at a depth of 7,310 feet in the Goff well, near Clarksburg, W. Va., showed an increase of 1° in about 70 feet.

BULLETIN 705. Conservation through engineering, by F. K. Lane. 1920. 38 pages.

The annual report of the Secretary of the Interior to the President contained a plea for constructive policies that deserves a hearing also by the engineers and business men who are developing the power resources of the country. The largest conservation for the future can come only through the wisest engineering of the present. The conditions under which the utilization of natural resources is demanded are outlined by Secretary Lane, who recommends a program that calls for the cooperation of engineer and legislator. To bring this power inventory to the attention of the men who furnish the country with its coal and oil and electricity, this extract from the Secretary's administrative report is reprinted as a bulletin of the United States Geological Survey.

BULLETIN 709-A. Triangulation and primary traverse in Delaware, Maryland, and West Virginia, 1916-1918, including results of leveling in Gunpowder quadrangle, Maryland, in 1918; R. B. Marshall, chief geographer. 1919. Pp. 1-22, Pls. I-II.

BULLETIN 709-B. Primary traverse in Florida, 1917; R. B. Marshall, chief geographer. 1919. Pp. 23-41, Pl. II.

Two chapters of a new bulletin giving results of triangulation and primary traverse during the years 1916 to 1918. This bulletin follows Bulletin 644, which contained results of similar work done in 1913 to 1915. Chapter A contains a map of the United States showing condition of astronomic location and primary control to January 1, 1919.

BULLETIN 710-A. A reconnaissance of the Pine Creek district, Idaho, by E. L. Jones, jr. 1919. Pp. 1-36, Pl. I.

The Pine Creek district, which lies west and south of the Coeur d'Alene region, had until recently been only slightly developed, but under the stimulus of high metal prices discoveries have been made and several old prospects whose ores could formerly not be profitably marketed have become productive. This report sets forth the geology of the district and describes the mines and prospects. The ores contain zinc, lead, and antimony. The total production of the district is not known, but ore to the value of several hundred thousand dollars was shipped in 1916.

BULLETIN 710-B. Deposits of manganese ore in New Mexico, by E. L. Jones, jr. 1919. Pp. 37-60, fig. 1.

The high prices for manganese ore that prevailed in 1917 and the summer of 1918 and the necessity for the production of domestic ores brought about by the curtailment of imports led to the search for and discovery of many deposits in some of the Western States. Most of the deposits in New Mexico were examined by the Survey, and the available information concerning them is here set forth. The total production in New Mexico of ores containing 35 per cent or more of manganese to December 31, 1918, was about 5,600 tons. Most of the deposits are small, the cost of mining and transportation is high, and at pre-war prices probably none of the deposits can be worked at a profit.

BULLETIN 710-C. Deposits of manganese ore in Costa Rica and Panama, papers by J. D. Sears. 1919. Pp. 61-91, Pl. II, figs. 2-29.

Throughout the war the Geological Survey made special field examinations and laboratory studies of deposits of ores of metals used in the manufacture of ferroalloys, pig iron, and steel and made estimates of tonnage for the war boards that were interested in the question of what supplies were available as substitutes for foreign ores. This paper gives the results of the examination of manganese deposits in Costa Rica and Panama. In Costa Rica the deposits are widespread, but most of them are either of low grade or of small extent. In October, 1918, ore was being produced at only three of the deposits. Labor is cheap, and deposits of any reasonable size could be developed at moderate expense, but only one other group of prospects seems to be promising. The two deposits in Panama described are northeast of the Canal Zone and contain 25,000 to 30,000 tons of manganese ore. An assay of the ore from one deposit showed 55 per cent of manganese.

BULLETIN 710-D. Deposits of manganese ore in Arizona, by E. L. Jones, jr., and F. L. Ransome. 1920. Pp. 93-184, Pls. III-VIII, figs. 36-37.

Deposits of manganese ore have long been known in some of the old mining districts of Arizona, but prior to 1915 the ore had been mined only incidentally where it formed the gangue of silver ores or was needed as a flux

for use in local smelters. Manganese ore as such was first shipped from the Tombstone district in 1915 and from the Globe and Bisbee districts in 1916. The high prices that were offered for manganese ore in 1916, 1917, and 1918 and the fact that the opening of new deposits would render patriotic service greatly stimulated the production of the ore and the search for new deposits. This paper sets forth the results of investigations made by two geologists of the Geological Survey who visited many deposits in different parts of the State. The deposits examined, about 75 in number, are scattered across the State from east to west but are all south of the Santa Fe Railway. Some of them are near a railroad, but most of them are more than 15 miles distant. The paper contains maps, sections, and views.

BULLETIN 710-E. Deposits of manganese ore in southeastern California, by E. L. Jones, jr. 1919. Pp. 185-208, Pl. IX.

Describes the manganese deposits in the desert region west of Colorado River, which in 1917 and 1918 yielded over 6,000 tons of high-grade ore and in which at least 30,000 tons is available. The costs of mining, transportation to the railroads, and shipment to furnaces east of Mississippi River are high, and when high-grade foreign ores are available these deposits can probably not be worked at a profit unless a nearer market can be found.

BULLETIN 710-F. Deposits of manganese ore in Nevada, by J. T. Pardee and E. L. Jones, jr. 1919. Pp. 209-248, Pl. X, figs. 38-39.

One of the reports on the Geological Survey's special investigations of manganese deposits that were made as a result of the war demand. During the war Nevada contributed about 25,000 tons of manganese ore, or 2 per cent of the total amount needed by the country. In December, 1918, production practically ceased. The deposits described in this paper are widely distributed over the State and are of several classes. The paper contains an index map showing their location and a plan and cross section of one of the deposits discovered during the war.

The pamphlet contains an index, title page, and table of contents for the use of those who may wish to bind the separate chapters of Bulletin 710.

BULLETIN 711-A. The Farnham anticline, Carbon County, Utah, by F. R. Clark. 1919. Pp. 1-13, Pls. I-II, fig. 1.

Describes a small upfold about 10 miles southeast of Price, Utah, on the automobile highway known as the Midland Trail. This anticline is structurally favorable for the accumulation of oil and gas, and the author concludes that the geologic conditions appear to warrant one or more test holes, locations for which are suggested.

BULLETIN 711-B. Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah, by D. D. Condit. 1919. Pp. 15-40, Pl. III, figs. 2-3.

Sets forth the results of a further investigation of the oil shales in the area near Dillon and Dell, in southwestern Montana, which were described briefly in Bulletin 661-I. The examination covered also the beds of the oil-shale formation in neighboring parts of Idaho, Wyoming, and Utah. The best beds in the Dillon-Dell area were found to yield 25 to 30 gallons of oil to the ton. No other promising localities were discovered.

BULLETIN 711-C. Peat in the Dismal Swamp, Virginia and North Carolina, by C. C. Osbon. 1919. Pp. 41-59, Pls. IV-VI.

The Dismal Swamp occupies a poorly drained depression lying between the ancient delta of James River, which forms the plain east and southeast of Norfolk, and the highlands on the west. In this depression peat has been accumulating since the Columbia epoch of Pleistocene time. In the earlier

stages of peat formation the swamp vegetation was mainly algae and mosses, which formed fine-grained peat, but as the water became shallower coarser plants established themselves, and it is believed that deciduous and coniferous trees have contributed the greater part of the dead vegetation from which the peat deposits of the region were formed. This paper gives an outline of the interesting story of the origin of peat, describes the deposits in the Dismal Swamp region, and discusses the uses of peat and methods of utilizing the deposits and marketing the product. It is illustrated by a map and halftone views.

BULLETIN 711-D. Oil in the Warm Springs and Hamilton domes, near Thermopolis, Wyo., by A. J. Collier. 1920. Pp. 61-73, Pls. VII-X, fig. 4.

Wildcat wells drilled near Thermopolis, Wyo., within the last two years have demonstrated that the Warm Springs and Hamilton domes, previously regarded as barren, contain oil in commercial quantities. The product of the Warm Springs domes is a heavy, dark oil, derived from beds of the same age as that of the Lander field, and the output is estimated at 800 to 1,000 barrels a day. The product of the Hamilton dome is a lighter oil derived from younger beds—the Chugwater formation, which has not heretofore yielded oil in commercial quantities. This paper describes the geology of the domes and contains maps and sections showing the structure.

BULLETIN 711-E. Gas in the Big Sand Draw anticline, Fremont County, Wyo., by A. J. Collier. 1920. Pp. 75-83, Pl. XI, figs. 4-5.

The Big Sand Draw anticline was tested in 1917-18 by a well that brought in a flow of about 7,000,000 cubic feet of gas a day. As it seemed possible that this anticline might contain a large quantity of oil, the Geological Survey made a careful examination of it to see if light could be thrown on some of the obscure points regarding its structure. This paper sets forth the results of the examination and gives a map and a hypothetical cross section based on the data obtained. A second well yielded 10,000,000 to 12,000,000 cubic feet of gas a day, and other tests are being made to determine whether oil may be found at greater depth or in a lower structural position.

BULLETIN 711-F. The Abram Creek-Stony River coal field, northeastern West Virginia, by G. H. Ashley. 1920. Pp. 85-103, Pls. XII-XIII.

The Abram-Creek Stony River coal field is a southward continuation of the Georges Creek and Elk Garden fields of Maryland and West Virginia. It contains a large body of low-volatile semibituminous coal and is nearer tidewater than any other Appalachian field except the Georges Creek and Upper Potomac. The coal is at present entirely undeveloped, and the area is without railroads, but it would require only a few miles of branch roads to reach lines running to Baltimore or Newport News. Interest had been aroused in this area because of the approaching exhaustion of the neighboring districts, and this report, which is based on two reconnaissance trips in the spring of 1918, was prepared to meet the need of information that is expected to arise. The report contains a new topographic map of the field, numerous graphic sections of the coal, analyses, and detailed descriptions of the different beds. The estimated recoverable coal in this field amounts to 422,000,000 tons.

BULLETIN 711-G. Geology and oil and gas prospects of the Huntley field, Montana, by E. T. Hancock. 1920. Pp. 105-148, Pls. XIV-XVIII, figs. 6-7.

The geology of the general region including the Huntley field, in Yellowstone and Big Horn counties, south-central Montana, has been studied at different times since 1882. The investigation whose results are set forth in this paper was undertaken primarily to make a detailed study of the

stratigraphy and structure in order to locate such structural features as have elsewhere been found to bear a definite relation to accumulations of oil and gas. The paper discusses the geology in detail and is illustrated by a geologic map, a plate of columnar sections, and several halftone views. There are in this area few surface indications of oil and gas, and logs of wells near the area do not indicate the presence of sands at all comparable with those of some of the productive fields of Wyoming. Some of the domes in the Lake Basin field, of which the Huntley field is an extension, are better adapted for the accumulation of oil and gas than any of the structural features in this field, and yet they seem to have yielded only showings of gas.

BULLETIN 711-H. Anticlines near Maverick Springs, Fremont County, Wyo., by A. J. Collier. 1920. Pp. 149-171, Pls. XIX-XXI, fig. 4.

Owing to the great demand for petroleum and its products and the success of oil wells in many parts of Wyoming, every locality in the State which is known to be at all favorable for the accumulation of petroleum is being tested with the drill, and vigorous search is being made for new localities. A well drilled in 1917-18 near Maverick Springs, Fremont County, brought in a flow of dark oil, and several other successful wells have since been drilled in the same vicinity. Development has not proceeded far enough to justify a prediction of the ultimate output of the field. It is 42 miles from the nearest railroad point, and if oil is discovered here in quantity a pipe line must be laid to that point before the field can be thoroughly developed. This paper describes the geologic features of the field and contains a topographic map and cross sections showing the structure.

This pamphlet contains an index, title-page, table of contents, and introduction for the use of those who may wish to bind the separate parts of Bulletin 711.

BULLETIN 712-A. The Alaskan mining industry in 1918, by G. C. Martin. 1919. Pp. 1-52.

BULLETIN 712-B. Water-power investigations in southeastern Alaska, by G. H. Canfield. 1919. Pp. 53-90.

BULLETIN 712-C. Nickel deposits in the lower Copper River valley, Alaska, by R. M. Overbeck. Pp. 91-98, fig. 1.

BULLETIN 712-D. Preliminary report on the chromite of Kenai Peninsula, Alaska, by A. C. Gill. 1919. Pp. 99-129, Pls. I-III.

BULLETIN 712-E. Mining in the Matanuska coal field and the Willow Creek district, Alaska, by Theodore Chapin. 1920. Pp. 131-176, Pls. IV-VI, figs. 2-5.

BULLETIN 712-F. Placer mining in the Tolovana district, Alaska, by R. M. Overbeck. 1920. Pp. 177-184.

BULLETIN 712-G. Mining in northwestern Alaska, by S. H. Cathcart. 1920. Pp. 185-198, figs. 6-10.

Chapters of the annual report on investigations of the mineral resources of Alaska for 1918. Contain several papers on the areas or subjects named in the titles.

BULLETIN 715-A. Potash deposits in Spain, by H. S. Gale. 1920. Pp. 1-15, Pls. I-III, figs. 1-3.

Potash was discovered accidentally in the salt deposits of the Province of Barcelona, in the northeast corner of Spain, in 1912, though the salt deposits themselves had been known for a hundred years. The potash field is about 75 miles long, and the claims or concessions form a practically continuous belt with a maximum width of 18 miles. A main-line railway

skirts the southern border of the field. This paper is based on a brief visit to the field in 1919 and sets forth the available information regarding it, with views and a sketch map. Mr. Gale concludes that the prospects of producing enough potash to meet Spanish needs seem promising, but that it is too soon to estimate the future position of this field in the world production of potash.

BULLETIN 715-B. The potash deposits of Alsace, by H. S. Gale. 1920. Pp. 17-55, Pls. IV-V, figs. 4-5.

Potash was discovered in Alsace in 1904, and the field, though less extensive than the famous Stassfurt region of Germany, was very soon recognized as having several advantages over the older field. The Alsatian deposits occur in regular beds underlying a large area, and the salts are very rich in potash and require only the simplest chemical treatment to yield a marketable product. The return of Alsace to France has broken the German monopoly of potash and stimulated interest in the Alsatian field. Mr. Gale visited the field in 1919 and presents in this paper the results of his own observations, together with a summary of previous reports on the field and an annotated bibliography. The field lies in the Rhine Valley, directly on the routes of main-line water and rail transportation. In 1913 it yielded 350,000 tons of crude salts. The paper contains some views of the mining plants and a section of one of the potash beds.

BULLETIN 716-A. Geology of Alamosa Creek valley, Socorro County, N. Mex., by D. E. Winchester. 1920. 18 pages, 5 plates.

During a detailed study of the coal resources of an area in Socorro County, N. Mex., considerable information relative to the stratigraphy and structure of the region was collected. Owing to the present interest in the oil and gas possibilities of New Mexico the observations made have been recorded in this paper as a guide in the search for petroleum and natural gas. The area described covers about 600 square miles and forms the southeastern part of the great San Juan Basin of New Mexico and Colorado. It contains no surface indications of oil and gas, so far as known, but the geologic conditions appear not to preclude their occurrence, and the author suggests certain localities where tests might be made. The paper contains a geologic map and several views.

BULLETIN 716-B. The Upton-Thornton oil field, Wyo., by E. T. Hancock. 1920. 20 pages, 1 plate, 1 text figure.

A small tract adjacent to the Chicago, Burlington & Quincy Railroad on the line between Crook and Weston counties, Wyo., has for the last few years yielded a moderate quantity of oil of excellent quality. This tract, which lies a short distance northwest of Thornton, is described in the present report, together with two structural domes that occur near Thornton and near Upton, a few miles to the southeast. The purpose of the investigation was to assist in the development of the field by making a detailed study of the geology in order to determine the position of the oil-bearing sands and the possibility of obtaining oil and gas in other sands. The two domes are uplifts of the rock beds, of the type that has elsewhere been found to have a definite relation to accumulations of oil and gas, and the author suggests that they should be carefully tested by drilling. The paper contains a map showing the geologic structure of the field.

WATER-SUPPLY PAPER 425. Contributions to the hydrology of the United States, 1917; N. C. Grover, chief hydraulic engineer, 1919. 161 pages, 14 plates, 7 text figures.

Contains five papers by four authors. Three of the papers were published in 1917; the other two were delayed by conditions due to the war until December, 1918.

WATER-SUPPLY PAPER 429. Ground water in the San Jacinto and Temecula basins, Calif., by G. A. Waring. 1919. 113 pages, 14 plates, 15 text figures.

The basins of San Jacinto and Temecula rivers lie in the western part of Riverside County, Calif., and cover somewhat less than 2,000 square miles. The San Jacinto basin is a plateau in relation to the adjacent lowlands of the Santa Ana River valley, for it lies 500 to 1,000 feet above them; but it is rimmed on all sides by an irregular upland and is distinctly a basin in form. The climate of this area is typical of the moderately elevated interior basins of southern California. The year is divided into a wet and a dry season, and the seasonal precipitation as recorded at two stations for varying periods between 1887 and 1916 averages 13 inches. The average annual temperature is about 62°. The effect of low precipitation and high temperature is shown in the character of the native vegetation, which consists largely of sagebrush and chaparral. Irrigation is necessary for agriculture, and several systems have been established, using both surface water and ground water. This report gives a sketch of the geology of the area and describes the ground-water supply in detail, with sections on the use of the water in irrigation and on its quality. Several of the pumping plants are described, and suggestions on suitable equipment and methods of operation are given. The report is based on a study begun in 1904 by W. C. Mendenhall and continued at intervals since then by G. A. Waring and Herman Stabler. It is illustrated with views of the region and detailed topographic and geologic maps.

WATER-SUPPLY PAPER 436. Surface-water supply of the United States, 1916, Part VI, Missouri River basin; N. C. Grover, chief hydraulic engineer; W. A. Lamb and Robert Follansbee, district engineers. 1919. 256+xlili pages, 2 plates.

WATER-SUPPLY PAPER 439. Surface water supply of the United States, 1916, Part IX, Colorado River basin; N. C. Grover, chief hydraulic engineer; Robert Follansbee, E. A. Porter, and C. C. Jacob, district engineers. 1919. 198+xxxiv pages, 2 plates.

WATER-SUPPLY PAPER 440. Surface water supply of the United States, 1916, Part X, The Great Basin; N. C. Grover, chief hydraulic engineer; E. A. Porter, C. C. Jacob, H. D. McGlashan, F. F. Henshaw, G. C. Baldwin, and Robert Follansbee, district engineers. 1919. 331+xxviii pages, 2 plates.

WATER-SUPPLY PAPER 442. Surface water supply of the United States, 1916, Part XII, North Pacific drainage basins, A, Pacific basins in Washington and upper Columbia River basin; N. C. Grover, chief hydraulic engineer; G. L. Parker and W. A. Lamb, district engineers. 1919. 203+li pages, 2 plates.

WATER-SUPPLY PAPER 443. Surface water supply of the United States, 1916, Part XII, North Pacific drainage basins, B, Snake River basin; N. C. Grover, chief hydraulic engineer; G. C. Baldwin, G. L. Parker, and F. F. Henshaw, district engineers. 1919. 186+li pages, 2 plates.

WATER-SUPPLY PAPER 444. Surface water supply of the United States, 1916, Part XII, North Pacific slope drainage basins, C, Lower Columbia River basin and Pacific slope drainage basins in Oregon; N. C. Grover, chief hydraulic engineer; F. F. Henshaw and G. L. Parker, district engineers. 1919. 190+li pages, 2 plates.

These papers present in condensed form the results of measurements of stream flow in the basins named in the titles during the year ending September 30, 1916. Data for gaging stations are given under the following heads: Location, Drainage area, Records available, Gage, Discharge meas-

urements, Channel and control, Extremes of discharge, Winter flow, Diversions, Regulation, Accuracy, and Cooperation. The books contain tables giving gage heights and daily and monthly discharges at each station and halftone plates showing typical gaging stations, current meters, and automatic water-stage recorders. At the end of each book is a list of gaging stations maintained now or in the past in the drainage basins covered and an annotated list of publications by the United States Geological Survey relating specifically to the region, as well as a similar list of reports that are of general interest in connection with hydrology and brief references to reports published by State and other organizations.

WATER-SUPPLY PAPER 446. Geology and ground waters of the western part of San Diego County, Calif., by A. J. Ellis and C. H. Lee. 1919. 318 pages, 47 plates, 18 text figures.

Extensive utilization of the underground water in San Diego County was begun only a few years ago, and much additional development is still possible. The potential demand probably exceeds that in any other settled part of California. Irrigation is necessary for the successful cultivation of most of the crops to which the climate and soil of the region are adapted. The climatic and scenic features of much of the county are attracting an ever-increasing number of temporary or permanent residents, and the demand for water for household and garden uses is destined to exceed the demand for water for irrigation in commercial agriculture. The surface waters of the county, though at times overwhelming in volume, are not reliable, and their utilization requires expensive storage and transmission works. The supplies of ground water, on the other hand, if available at all, are relatively reliable, especially if they are drawn upon only to supplement surface supplies. They are also protected from evaporation and can be more easily protected from pollution, to both of which the surface waters are subject. The major river valleys, with ample stores of ground water and low pumping lifts, have been largely developed, but there still remains much additional land in small tracts outside these valleys that can be irrigated from ground water obtained locally. The importance of ground water as a reserve in periods of drought makes accurate knowledge of the quantity available essential to permanent settlement. The investigations reported in this paper were made not only to suggest where and how ground water may be obtained but also to indicate the limits to which the supplies of ground water should be utilized. The investigations covered an area of about 3,000 square miles and were made by the United States Geological Survey in cooperation with the State of California and the city of San Diego. The field work included a study of the geology and physiography of the area, measurements of water level in wells, observations of stream flow, tests of typical wells and pumping plants, collection of information concerning other wells and plants, tests of porosity of water-bearing deposits, collection of records of precipitation and evaporation, and collection of water samples. The observations on ground water were continued without interruption for about a year. The report sets forth the information obtained and the conclusions reached in great detail, with elaborate illustrations, including numerous diagrams and topographic maps.

WATER-SUPPLY PAPER 448. Gazetteer of streams of Texas, prepared under the direction of G. E. A. Gray. 1919. 267 pages.

A gazetteer of streams, lakes, and ponds shown on topographic maps published by the Geological Survey, county maps, the post-route map, and

other maps from miscellaneous sources. Contains about 4,000 names with brief descriptions.

- WATER-SUPPLY PAPER 450-A.** Geology and water resources of the Gila and San Carlos valleys in the San Carlos Indian Reservation, Ariz., by A. T. Schwen-nesen. 1919. Pp. 1-27, Pls. I-IV, figs. 1-2.

In recent years the Indian farmers in the valleys of Gila and San Carlos rivers, in the San Carlos Indian Reservation, Ariz., have been seriously handicapped by an inadequate supply of water for irrigating their crops. The present system uses surface water from the streams, and any extensions to it would be subject to the same liability of failure. At the request of the United States Office of Indian Affairs, the Geological Survey made an investigation to determine the feasibility of drilling wells to obtain a supply of ground water for use in irrigation, and this paper sets forth the results. The author concludes that sufficient water can be obtained in the river valleys by pumping from shallow wells. The water in the San Carlos Valley is suitable for this purpose, but that obtained from such wells in the Gila Valley is heavily mineralized and might eventually be deleterious to crops. This point should be determined by actual experiment. The paper contains several maps.

- WATER-SUPPLY PAPER 450-B.** Ground water in Lanfair Valley, Calif., by D. G. Thompson. 1920. Pp. 29-50, Pls. V-VI, fig. 3.

Lanfair Valley is an alluvial plain covering about 260 square miles in the east-central part of San Bernardino County, Calif. During the last two or three years many settlers have taken up homesteads in this valley and have been attempting to raise crops by dry farming, on the whole with only fair success. This paper gives data on the supply of ground water in the valley. The water seems to be of satisfactory quality for irrigation, but the supply is apparently nowhere sufficient, and the high lift required to bring it to the surface in the main part of the valley prohibits its use for irrigation except on especially valuable crops. The paper contains a topographic map of the valley and adjacent region.

- WATER-SUPPLY PAPER 450-C.** Ground water in Pahrump, Mesquite, and Ivanpah valleys, Nevada and California, by G. A. Waring. 1920. Pp. 51-86, Pls. VII-XI, figs. 4-5, 1 insert.

In eastern California and southern Nevada there are numerous detached drainage basins that have no outlets for their surface water. Most of these basins contain no large perennial streams, but water is obtained from springs. Within the last few years attempts have been made in the three basins described in this paper to obtain water for irrigation by sinking wells, and the paper sets forth the results of an examination made to determine the amount of ground water available and its adaptability to successful farming. The examination showed that water of good quality for irrigation can be obtained in some parts of each of the three basins. The paper contains a topographic map of the region and several views and well sections.

This pamphlet includes an index, title-page, and table of contents for the use of those who may wish to bind the separate parts of Water-Supply Paper 450.

- WATER-SUPPLY PAPER 454.** Surface water supply of the United States, 1917, Part IV, St. Lawrence River basin; N. C. Grover, chief hydraulic engineer; W. G. Hoyt, A. H. Horton, C. C. Covert, and C. H. Pierce, district engineers. 1919. 154 pages, 2 plates.

- WATER-SUPPLY PAPER 455.** Surface water supply of the United States, 1917, Part V, Hudson Bay and upper Mississippi River basins; N. C. Grover, chief hydraulic engineer; W. G. Hoyt, district engineer. 1919. 207+xxx pages, 2 plates.
- WATER-SUPPLY PAPER 457.** Surface water supply of the United States, 1917, Part VII, Lower Mississippi River basin; N. C. Grover, chief hydraulic engineer; Robert Follansbee, district engineer. 1919. 35+xxxiii pages, 2 plates.
- WATER-SUPPLY PAPER 458.** Surface water supply of the United States, 1917, Part VIII, Western Gulf of Mexico basins; N. C. Grover, chief hydraulic engineer; G. A. Gray and Robert Follansbee, district engineers. 1919. 106+xxviii pages, 2 plates.
- Similar in scope to Water-Supply Papers 436, 439, 440, 442, 443, and 444, noticed above.
- WATER-SUPPLY PAPER 485.** Surface water supply of Hawaii, July 1, 1917, to June 30, 1918; N. C. Grover, chief hydraulic engineer; C. T. Bailey, acting district engineer. 1919. 169 pages.
- Presents the results of measurements of stream flow in the Hawaiian Islands during the period named. Most of the data were collected under a cooperative agreement with the Territory of Hawaii, which has borne 60 to 80 per cent of the cost of the field work. This cooperative work has been carried on since July 1, 1910. The United States Army, the city and county of Honolulu, and several individuals and corporations have also cooperated in the investigations. The book contains in addition to the stream measurements records of rainfall at 33 stations in the islands.
- MINERAL RESOURCES OF THE UNITED STATES, 1916. Part I, Metals; H. D. McCaskey, geologist in charge.** 1919. 933 pages, 3 plates, 10 text figures, 1 insert. (One advance chapter also published during the year.)
- MINERAL RESOURCES OF THE UNITED STATES, 1916. Part II, Nonmetals; E. F. Burchard and G. F. Loughlin, geologists in charge.** 1919. v+1,115 pages, 4 plates, 23 text figures.
- MINERAL RESOURCES OF THE UNITED STATES, 1917. Part II, Nonmetals; G. F. Loughlin, geologist in charge.** 1,287 pages, 1 plate, 42 text figures, 5 inserts. (Seven advance chapters from Part I and five from Part II also published during the year.)
- MINERAL RESOURCES OF THE UNITED STATES, 1918.** Fifty-five advance chapters.
- MINERAL RESOURCES OF THE UNITED STATES, 1919.** One advance chapter.
- GEOLOGIC FOLIO 209.** Newell, S. Dak., by N. H. Darton. 1919. 7 pages, 3 maps, 1 sheet of illustrations.

The Newell quadrangle, which covers 850 square miles in Butte and Meade counties, S. Dak., lies near the western margin of the Great Plains province, a vast area that extends from the foot of the Rocky Mountains eastward to the valley of the Mississippi. The front ridges of the Black Hills rise a short distance south of the quadrangle, but most of it lies at altitudes between 2,700 and 3,000 feet above the sea, and the maximum relief is less than 1,000 feet. Some of the striking topographic features of the quadrangle are the steep fronts of certain cuestas or sloping plains and the numerous "tepee buttes," steep-sided conical buttes as much as 100 feet high. The only valuable mineral resources of this area are the soils and the underground water. Flowing water can be obtained in a considerable area in the southwestern part of the quadrangle. This folio contains maps showing the topography, geology, and artesian-water conditions of the quadrangle and a sheet of half-tone views.

GEOLOGIC FOLIO 210. Herman-Morris, Minn., by F. W. Sardeson. 1919. 10 pages, 8 maps, 12 text figures.

This folio describes the Herman, Barrett, Chokio, and Morris quadrangles, which cover 835 square miles in western Minnesota, near the latitude of the line between North and South Dakota. These quadrangles lie in the Glaciated Plains province, and the surficial deposits are entirely of glacial origin. These deposits are underlain by pre-Cambrian crystalline rock, which is nowhere exposed in this area but has been reached in wells at depths of 42 to 480 feet. The area is in general a gently undulating plain whose greatest relief is about 380 feet, but in detail the surface is diversified by the numerous roundish lakes, irregular knobs, and other features so characteristic of a glaciated region. A low plain in the north-western part of the area is a portion of the bed of the glacial Lake Agassiz, and across it extend two beach ridges that mark different stages of the lake. The principal mineral resources of this area are the abundant water and the rich soil. This folio contains a topographic map and a geologic map of each of the four quadrangles.

TOPOGRAPHIC AND OTHER MAPS, as follows:

Arizona.

State map. Scale, 1 inch=8 miles.

Base map of the State printed in black only. Shows the county and township boundaries, the names of all towns, and most of the names of even the small settlements, the railroads, all rivers, and many of the smaller streams and water features.

California.

Adelaida. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, 35° 30' to 35° 45'; longitude, 120° 45' to 121°.

Map of the mountains a short distance east of the Pacific Ocean somewhat south of the west-central part of California. The higher points are in the Santa Lucia Range, in the southwestern part of the area, and stand at elevations of 2,500 to 2,900 feet, but throughout the area the summits of the uplands rise to elevations of 1,500 to 2,000 feet. Several good examples of discontinuous streams, such as Santa Rita, Jack, and Sheepcamp creeks, are represented.

Junipero Serra. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, 36° to 36° 15'; longitude, 121° 15' to 121° 30'.

Map of part of the mountains a short distance from the coast in Monterey County, southwestern California. There are no towns in the area. The slopes of the mountains are everywhere steep, so that in only a few places are they traversed by trails, and even along the floors of the valleys of the larger streams there is but little travel, not much more than 10 miles of first-class road being found within the entire area.

King City. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, 36° to 36° 15'; longitude, 121° to 121° 15'.

Map of part of Salinas River in Monterey County, which flows on a broad valley floor, on either flank of which rise ranges of dissected mountains that drain northwestward. Few of the peaks rise to elevations of more than 2,500 feet, or about 2,200 feet above the floor of the main valley. No perennial streams except Salinas River are indicated.

Kismet. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, 37° to 37° 7' 30''; longitude, 120° to 120° 7' 30''.

Map of the dissected plain east of the lowland of the Great Valley of California southeast of Merced. The surface of the plain slopes in general

southwestward. In the eastern part it stands at an elevation of about 400 feet, and in the southwestern part at an elevation of 250 feet. None of the streams represented are perennial.

- La Grange.** Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 5 feet. (Part of quadrangle.) Latitude, $37^{\circ} 37' 30''$ to $37^{\circ} 45'$; longitude, $120^{\circ} 22' 30''$ to $120^{\circ} 30'$.

Map of part of Tuolumne River and the adjacent hilly region in Tuolumne and Stanislaus counties. Numerous developments of the water resources, including dams, canals, ditches, and reservoirs, are indicated on the map. The geology of this region is described and mapped on the scale of 1 inch to 2 miles in the Sonora folio, No. 41 (out of print, but available in the larger public libraries).

- Merced Falls.** Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 5 feet. (Part of quadrangle.) Latitude, $37^{\circ} 30'$ to $37^{\circ} 37' 30''$; longitude, $120^{\circ} 15'$ to $120^{\circ} 22' 30''$.

Map of a small area adjacent to Merced River. In the eastern part of the area the river flows in a narrow canyon, along whose steep north and west walls are laid the tracks of the Yosemite Valley Railroad. Farther west the valley broadens out, terraces appear here and there on its sides, and the lowland has topographic features formed by the river during its overflow or during its change of course.

- Orestimba.** Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $37^{\circ} 15'$ to $37^{\circ} 30'$; longitude, 121° to $121^{\circ} 15'$.

Map of parts of Stanislaus and Merced counties. The eastern part of the area is the broad, flat plain adjacent to San Joaquin River, and the western part, which rises rather abruptly from the plain, consists of mountains that culminate in Orestimba Peak (2,073 feet). A noteworthy feature of the mountainous area is the north-south trend of many of the ridges and lowlands, which probably conforms to the trend of the lines of geologic structure.

- Paso Robles.** Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $35^{\circ} 30'$ to $35^{\circ} 45'$; longitude, $120^{\circ} 30'$ to $120^{\circ} 45'$.

Map of part of San Luis Obispo County, a dissected, hilly region of moderate elevation, practically devoid of perennial streams. One of the most noteworthy features is the broad-floored valley of Salinas River, in which no stream is represented except for a stretch of about 1 mile near San Miguel. The course followed by Salinas River during the short periods when it is actually a stream is shown by stippling representing sand.

- Raynor Creek.** Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 5 feet. Latitude, $37^{\circ} 7' 30''$ to $37^{\circ} 15'$; longitude, 120° to $120^{\circ} 7' 30''$.

Map of part of the foothills in Merced, Mariposa, and Madera counties and the dissected plain that slopes westward from them to form the lowlands of the Great Valley of California. The trench occupied by Chowchilla River in times of heavy run-off, which traverses both the hills and the plain, is mapped without even an indication of an intermittent stream. This map should be of special value to teachers of physiography in illustrating numerous kinds of topography.

- San Simeon.** Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $35^{\circ} 30'$ to $35^{\circ} 45'$; longitude, 121° to $121^{\circ} 15'$.

Map of part of the coast of California and the Santa Lucia Range, in San Luis Obispo County. A slightly settled mountainous region, whose highest points rise to elevations of 3,500 feet and much of whose surface stands at elevations of more than 2,000 feet. Rocks and rocky islets

project above the sea at frequent intervals a short distance offshore, and the coast line is somewhat irregular.

Sulphur Springs. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. (Part of quadrangle.) Latitude, 37° to $37^{\circ} 7' 30''$; longitude, $119^{\circ} 37' 30''$ to $119^{\circ} 45'$.

Map of part of San Joaquin River and the dissected hilly country adjacent to it in Madera and Fresno counties. In the eastern part of its course the river flows in a narrow canyon whose walls rise precipitously more than 200 feet above it, but farther west the slopes are less steep and their smoothness is interrupted by terraces at several different elevations.

Colorado.

Daton Peak. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $40^{\circ} 15'$ to $40^{\circ} 30'$; longitude, $107^{\circ} 15'$ to $107^{\circ} 30'$.

Map of parts of Moffat and Routt counties, in northwestern Colorado. In the southern part of the region there are mountain peaks that rise to elevations above 9,000 feet. These are outliers of the great "Flat-tops," or White River Plateau, one of the most conspicuous features in western Colorado. The flanks of these mountains descend northward to a valley that stands at an elevation of 6,500 to 7,000 feet, occupied by Williams Fork and its tributaries. North of this valley steep slopes, broken by small terraces, lead to the upland that culminates in the peaks of the Williams Fork Mountains. From the summit of this range the slopes descend northward more or less smoothly to the valley floor of Yampa River, which occupies the extreme northern part of the area mapped. The long, gentle northern slopes and the steep, short southern slopes are due to the northward dip of the rocks.

Colorado-Wyoming.

Home. Scale, 1 inch=2 miles; contour interval, 100 feet. Latitude, $40^{\circ} 30'$ to 41° ; longitude, $105^{\circ} 30'$ to 106° .

Map of part of Larimer and Jackson counties, Colo., and of a strip less than a quarter of a mile wide and 28 miles long in Albany County, Wyo. The topography is mountainous. Many of the peaks of the Medicine Bow Mountains rise to elevations of more than 12,000 feet above the sea and the lowest points to about 7,500 feet. Most of the region lies in the Colorado and Arapahoe national forests and the Rocky Mountain National Park.

Georgia.

Claxton. Scale, 1 inch=1 mile; contour interval, 19 feet. Latitude, 32° to $32^{\circ} 15'$; longitude, $81^{\circ} 45'$ to 82° .

Map of area in eastern Georgia 30 to 40 miles west of Savannah, including parts of Evans, Tattnall, Liberty, Bryan, and Bulloch counties, a region of low relief, whose uplands nowhere stand as much as 200 feet above the sea and whose lowlands have an elevation of at least 60 feet. The largest stream, Canoochee River, flows in numerous small angular bends on a moderately wide valley floor.

Egypt. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $32^{\circ} 15'$ to $32^{\circ} 30'$; longitude, $81^{\circ} 15'$ to $81^{\circ} 30'$.

Map of part of the Coastal Plain in Effingham and Bulloch counties, in eastern Georgia, whose uplands stand about 100 feet above sea level and whose lowlands are less than 20 feet above the sea. Much of even the higher ground is swampy, and the lowlands near the river are so wet that practically everywhere they are untraversed by roads.

Glennville. Scale, 1 inch = 1 mile; contour interval, 10 feet. Latitude, $31^{\circ} 45'$ to 32° ; longitude, $81^{\circ} 45'$ to 82° .

Map of parts of Liberty, Tattnall, and Wayne counties, in eastern Georgia. Most of the area stands between elevations of 50 to 175 feet above the sea. The lowest part of the region is the area occupied by Altamaha River, southwest of which steep slopes, 100 feet high, lead to the nearly flat upland. North of this stream there is a lowland 7 miles or more wide, whose surface stands at an elevation of less than 100 feet. North of this lowland moderately steep slopes, 50 feet or more high, lead to an upland whose surface stands at about the same elevation as that of the upland southwest of the river, 160 to 175 feet.

Millen. Scale, 1 inch = 1 mile; contour interval, 10 feet. Latitude, $32^{\circ} 45'$ to 33° ; longitude, $81^{\circ} 45'$ to 82° .

Map of part of Jenkins, Screven, and Burke counties, in eastern Georgia, a region much dissected by streams, whose valleys in their lower stretches are swampy and are avoided by roads. The largest river shown is the Ogeechee, which flows through a swampy lowland, more than a mile wide, in the southwestern part of the area.

Georgia-South Carolina.

[See also South Carolina-Georgia.]

Greens Cut. Scale, 1 inch = 1 mile; contour interval, 20 feet. Latitude, 33° to $33^{\circ} 15'$; longitude, $81^{\circ} 45'$ to 82° .

Map of parts of Burke and Richmond counties, Ga., and Aiken and Barnwell counties, S. C., a region of rather low relief. The highest point in the area mapped is about 300 feet above the sea; the lowest points, which lie along Savannah River, a stream that marks the boundary between the two States, are about 100 feet above the sea. On the higher uplands are numerous depressions, whose form and distribution suggest that they may be sink holes.

Idaho.

[See Montana-Idaho.]

Kentucky-Virginia.

Nolansburg. Scale, 1 inch = 1 mile; contour interval, 50 feet. Latitude, $36^{\circ} 45'$ to 37° ; longitude 83° to $83^{\circ} 15'$.

Map of part of plateau region formed of northward-dipping rocks, considerably dissected by tributaries of Cumberland River. Noteworthy features of the region are the steep northward-facing slope of Pine Mountain and the lowland followed by Laurel and Line forks, features apparently due to an old fault that lies essentially in the course followed by the lowland.

Maine-New Hampshire.

Portsmouth. Scale, 1 inch = 1 mile; contour interval, 20 feet. Latitude, 43° to $43^{\circ} 15'$; longitude, $70^{\circ} 30'$ to 71° .

This map is a double sheet formed by combining the maps of the resurveyed York and Dover quadrangles. The surface of the country is decidedly uneven, as knobs and low hills separated by swamps occur with no regular arrangement. The highest point in the area is Mount Agamenticus (692 feet above sea level), a well-known local landmark.

York. Scale, 1 inch = 1 mile; contour interval, 20 feet. Latitude, 43° to $43^{\circ} 15'$; longitude, $70^{\circ} 30'$ to $70^{\circ} 45'$.

Map showing the results of the resurvey of the York quadrangle. It also forms the eastern part of the double sheet known as the Portsmouth map.

Minnesota.

St. Francis. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, 45° 15' to 46°; longitude, 93° 15' to 93° 30'.

Map of part of the glaciated plain of east-central Minnesota north of Minneapolis and St. Paul, which is characterized by irregularly distributed small knobs and depressions, the larger of which contain lakes. The largest stream of the region, Rum River, flows alternately through swampy lowlands and through tracts of higher ground. Nowhere has the drainage of the area been long or effectively established.

Montana-Idaho.

St. Regis. Scale, 1 inch=2 miles; contour interval, 100 feet. Latitude, 47° to 47° 30'; longitude, 115° to 115° 30'.

Map of part of the Bitterroot and Coeur d'Alene mountains, many of whose peaks rise to elevations of more than 7,000 feet, and whose lowest points, in the valley of the largest stream, Clark Fork, are only about 2,600 feet above the sea. The valley of St. Regis River, a tributary of Clark Fork, is followed by both the Chicago, Milwaukee & St. Paul and the Northern Pacific railways as they climb westward to cross the Bitterroot Mountains.

New Hampshire.

[See also Maine-New Hampshire.]

Gilmanton. Scale, 1 inch=1 mile; contour interval, 20 feet. Latitude, 43° 15' to 43° 30'; longitude, 71° 15' to 71° 30'.

Map of part of the hilly region of central New Hampshire south of Lake Winnepesaukee. Many of the low areas are occupied by lakes and ponds or by marshy tracts, which appear to mark the sites of lakes that have been drained or filled. The present aspect of the region is in large measure due to glaciation.

Mount Pawtuckaway. Scale, 1 inch=1 mile; contour interval, 20 feet. Latitude, 43° to 43° 15'; longitude, 71° to 71° 15'.

Map of parts of Strafford and Rockingham counties, in the eastern part of New Hampshire, an area characterized by numerous ponds and marshes, many low hills, and a few small higher tracts, such as Pawtuckaway and Saddleback mountains. The diversified topography is largely due to ancient glaciation.

New Mexico.

Columbus. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, 31° 45' to 32°; longitude, 107° 30' to 107° 45'.

This area has been described by Prof. W. M. Davis as follows:

"The map shows an area west of the Rio Grande, adjoining Mexico. The minutely dissected Tres Hermanas Mountains, in the western part of the area, rise to heights above 5,500 feet, and the long piedmont slope of the Florida Mountains enters the area from the north. A rectangular system of roads serves the ranches on the plains east of the piedmont slopes, but the roads in the mountainous area on the west follow courses that are governed by topographic features. A railway runs in a straight line for 7 miles across the plains but turns and winds somewhat as it passes toward and through the mountains. The 'Deming road,' which runs a little west of north straight across the area, follows the bed of a railroad that was graded many years ago but that was abandoned, no tracks having been laid. It was this road that Gen. Pershing and his troops fol-

lowed when he pursued Villa into Mexico after the bandit's raid on Columbus in March, 1916."

Pratt. Scale, 1 inch=1 mile; contour interval, 25 feet. Latitude, 31° 45' to 32°; longitude, 108° 45' to 109°.

Map of part of Grant County, in the extreme southwestern part of New Mexico, whose most interesting topographic features are the rugged Peloncillo Mountains. The highest peaks of these mountains rise to elevations of over 6,000 feet, and from their base extend sloping plains, those on the western flank forming part of San Simon Valley and those on the eastern flank Animas Valley. Tank Mountain rises above the eastward-sloping plain as an outlying rocky ridge. A low gap through the Peloncillo Mountains, Antelope Pass, affords a fine route, which is used by the El Paso & Southwestern Railroad. No perennial streams occur in the region.

New Mexico-Texas.

Canutillo. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, 31° 45' to 32°; longitude, 106° 30' to 106° 45'.

Map of part of southwestern New Mexico and western Texas, whose surface in different parts presents great topographic contrasts. In the eastern part are the rugged slopes and sharp crests of the Franklin Mountains, whose peaks rise to elevations of more than 6,000 feet. Farther west the slopes become more gentle and descend to the valley of the Rio Grande, which is here 2 or 3 miles wide, though farther south this lowland is absent and the river flows through a narrow canyon, at the eastern end of which is the city of El Paso (the pass). West of the lowland rather steep slopes rise about 300 feet above the river and lead to a nearly flat upland or plateau that stands at an elevation of about 4,100 feet. The map should be of great service in classroom studies of physiography.

North Carolina.

[See Virginia-North Carolina.]

Oregon.

Willamette Valley, sheet 9 (part of double quadrangle). Scale, 1 inch= $\frac{1}{2}$ mile; contour intervals, 5 feet and 25 feet. Latitude, 44° 37' 30'' to 44° 45'; longitude 123° 7' 30'' to 123° 22' 30''.

Map of part of Willamette River and the hilly region west of it. The lowlands for several miles from the river have been formed during the earlier stages of the development of the region and show terraces and abandoned courses of the stream. Only the lower slopes of the canyons that occupy the western part of the area are mapped.

South Carolina.

Charleston. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, 32° 45' to 32° 52' 30''; longitude, 79° 52' 30'' to 80°.

Fort Moultrie. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, 32° 45' to 32° 52' 30''; longitude, 79° 45' to 79° 52' 30''.

Johns Island. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude 32° 45' to 32° 52' 30''; longitude, 80° to 80° 7' 30''.

Three of the group of maps on a large scale (1:21,120) which show some of the coastal country adjacent to Charleston. Little of the region is as much as 40 feet above the sea, and much is swampy land practically at

sea level, sparsely inhabited except in the immediate neighborhood of Charleston, which owes its position to the good harbor afforded by the drowned lower courses of Cooper, Wando, and Ashley rivers.

Ridgeville. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, 33° to $33^{\circ} 15'$; longitude, $80^{\circ} 15'$ to $80^{\circ} 30'$.

Map of a part of the Atlantic Coastal Plain, showing a flat area standing about 100 feet above the sea, traversed by flat-bottomed valleys that are occupied by tributaries of Edisto River and bordered by steep escarpments.

The Jetties. Scale, 1 inch= $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, $32^{\circ} 37' 30''$ to $32^{\circ} 45'$; longitude, $79^{\circ} 45'$ to $79^{\circ} 52' 30''$.

Map of the Atlantic Ocean off the entrance to the port of Charleston, in which less than a square mile of land is shown. Noteworthy features of the area are the two long jetties that protect the entrance to the harbor and that extend 3 to 4 miles out into the sea. The depths of the ocean off-shore are shown by contours drawn through points 5, 10, and 20 feet below mean low-water level.

Wadmelaw Island. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $32^{\circ} 30'$ to $32^{\circ} 45'$; longitude, 80° to $80^{\circ} 45'$.

Map of part of the coastal region of South Carolina, an area in Charleston County. Maps of the eastern half of this area have also been recently published on a scale of 3 inches to the mile, contour interval 5 feet, as the Legareville and Kiawah Island sheets. No point in the area is as much as 40 feet and most of it is less than 20 feet above the sea.

South Carolina-Georgia.

[See also Georgia-South Carolina.]

Peeples. Scale, 1 inch = 1 mile; contour interval, 10 feet. Latitude, $32^{\circ} 45'$ to 33° ; longitude, $81^{\circ} 15'$ to $81^{\circ} 30'$.

Map of part of Savannah River, which here forms the boundary between the States of South Carolina and Georgia, and the low swampy plain adjacent to it in Barnwell and Hampton counties, S. C., and Screven County, Ga. The lowland, 3 to 5 miles wide, through which the main river flows, is an untraversable swamp, and the only good roads leading to the stream are those on the higher ground, where the river in its irregular course swings against the bluffs to the east of this lowland.

Texas.

[See also New Mexico-Texas.]

Aldine. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. Latitude, $29^{\circ} 52' 30''$ to 30° ; longitude, $95^{\circ} 22' 30''$ to $95^{\circ} 30'$.

Map of part of the plain in Harris County, whose surface at no place within the area shows differences of elevation of as much as 50 feet. Numerous irregularly distributed small depressions occur throughout the region. Crescentic ridges, some of which are nearly complete rings an eighth of a mile in diameter, are common and form unusual topographic features.

Alief. Scale, 1 inch = $\frac{1}{2}$ mile. Contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 37' 30''$ to $29^{\circ} 45'$; longitude, $95^{\circ} 30'$ to $95^{\circ} 37' 30''$.

Map of part of plain in Harris County, southwest of Houston. The use of a very small contour interval permits the representation of many minute details of topography, but the greatest differences in elevation throughout the area are less than 50 feet.

Almeda. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 30'$ to $29^{\circ} 37' 30''$; longitude, $95^{\circ} 22' 30''$ to $95^{\circ} 30'$.

Map of part of southern Harris County, 10 to 15 miles south of Houston, a region of slight relief, standing 50 to 70 feet above sea level. No perennial streams are indicated on the map.

Beaver Creek. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, $33^{\circ} 52' 30''$ to 34° ; longitude, $98^{\circ} 52' 30''$ to 99° .

Map of part of the dissected plain in Wichita and Wilbarger counties. A noteworthy feature of the region is that none of the streams except Beaver Creek are perennial. Beaver Creek flows in a narrow trench cut at least 25 feet below the flat surface, which appears to have been the flood plain of a former larger stream.

Cedar Bayou. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 45'$ to $29^{\circ} 52' 30''$; longitude, $94^{\circ} 52' 30''$ to 95° .

Map of the extreme eastern part of Harris County, in east-central Texas, a nearly flat plain in which Cedar Bayou has cut a steep-sided trench, the floor of which is so narrow that it is entirely occupied by the stream. The greatest difference in elevation throughout the quadrangle is less than 45 feet, the lowest point being practically at sea level.

Clodine. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 37' 30''$ to $29^{\circ} 45'$; longitude, $95^{\circ} 37' 30''$ to $95^{\circ} 45'$.

Map of the southern part of Harris County, most of which is a plain. Many small intermittent ponds are scattered irregularly over the surface. A more or less rectangular system of ditches intersects the region. Buffalo Bayou, the only perennial stream represented, has had its original circuitous course artificially straightened, so that as mapped it presents a singular appearance.

Crosby. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. Latitude, $29^{\circ} 52' 30''$ to 30° ; longitude, 95° to $95^{\circ} 7' 30''$.

Map of part of eastern Harris County, most of which is flat plain but whose southwestern part is traversed by San Jacinto River, which, with its tributaries, has cut a trench whose lowest parts are 30 to 40 feet below the adjacent upland. In the trench are many irregular-shaped knolls and depressions which represent features carved by the stream during earlier stages of its development. The small contour interval used allows most of even the smallest details to be clearly represented.

Fowlkes. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 5 feet. Latitude, $33^{\circ} 52' 30''$ to 34° ; longitude, $98^{\circ} 45'$ to $98^{\circ} 52' 30''$.

Map of part of Wichita River in Wichita County and the dissected low rolling hills to the north. Few places within the mapped area have elevations above sea level greater than 1,135 feet or less than 975 feet.

Harmaston. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. Latitude, $29^{\circ} 52' 30''$ to 30° ; longitude, $95^{\circ} 7' 30''$ to $95^{\circ} 15'$.

Map of a small part of Harris County, including the southern part of the Humble oil field. The only break in the level upland is that made by the valley of San Jacinto River, which is a flat trough about 1 mile wide and 25 to 40 feet deep. All irregularities of the surface are represented by the contour lines, so that an engineer could plan drainage ditches or railroad grades from this map without a transit or level.

Hockley. Scale, 1 inch = $\frac{1}{2}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, 30° to $30^{\circ} 7' 30''$; longitude, $95^{\circ} 45'$ to $95^{\circ} 52' 30''$.

The territory represented by this map is a small part of northwestern Harris County, in the vicinity of the town of Hockley, 30 miles northwest

of Houston. The map shows the surface in great detail, every bank and hillock a foot or more high being represented. The country is greatly rolling, with many depressions, like sinkholes, ranging from a few feet to 1,000 feet or more in diameter. The lowest land in Spring Creek valley is 175 feet above the sea, and the highest west of Hegor School about 280 feet. Spring Creek flows in a narrow valley bordered by a belt of broken country 50 to 75 feet high.

Humble. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. Latitude, $29^{\circ} 52' 30''$ to 30° ; longitude, $95^{\circ} 15'$ to $95^{\circ} 22' 30''$.

Map of part of the dissected plain north of Houston, in Harris County, the most noteworthy feature of which is Humble, a town that has grown up as the result of the discovery of oil in its vicinity. The oil wells and many large tanks for the storage of oil indicate the importance of the oil industry of this region.

Katy. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 45'$ to $29^{\circ} 52' 30''$; longitude, $95^{\circ} 45'$ to $95^{\circ} 52' 30''$.

Map of part of western Harris County, a plain whose surface slopes gently and rather uniformly southeastward from an elevation of about 170 feet in the extreme northwest to about 115 feet in the extreme southeast corner. Numerous narrow depressions, some of which contain lakes, dot the surface of the plain.

Maravillas Canyon. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $29^{\circ} 30'$ to $29^{\circ} 45'$; longitude, $102^{\circ} 45'$ to 103° .

Map of part of Brewster County, in the south-central part of the State, a region whose surface is so much dissected that its relief is strong, the high points standing at elevations of nearly 4,000 feet, whereas the low tracts are not much more than 1,600 feet above the sea. All the streams except the Rio Grande are intermittent, a fact that makes the course of Maravillas Canyon across the area especially noteworthy.

Morgan Point. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 37' 30''$ to $29^{\circ} 45'$; longitude $94^{\circ} 52' 30''$ to 95° .

Map of part of Galveston and San Jacinto bays and the adjacent country. One of the unique features of the area is the cut that has been dredged across the eastern end of Atkinson Island and the embankment that has been built out to sea from it so as to form a ship channel and breakwater.

Mykawa. Scale 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $29^{\circ} 30'$ to $29^{\circ} 37' 30''$; longitude, $95^{\circ} 15'$ to $95^{\circ} 22' 30''$.

Map of south-central part of Harris County, a region of low relief. The difference in elevation between the highest and lowest points shown in the area is less than 25 feet, the range in elevation being from 37 to 61 feet above the sea.

Rose Hill. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, 30° to $30^{\circ} 37' 30''$; longitude, $95^{\circ} 37' 30''$ to $95^{\circ} 45'$.

Map of a part of northern Harris County which shows a range of relief that is considerable for this part of Texas and is rather accentuated on the map because of the small contour interval. Spring Creek, which forms the northern boundary of the county, has cut a narrow valley about 100 feet below the summit of the near-by uplands.

Seabrook. Scale, 1 inch=1 mile; contour interval, 1 foot. Latitude, $29^{\circ} 30'$ to $29^{\circ} 37' 30''$; longitude, 95° to $95^{\circ} 7' 30''$.

Map of the extreme southeastern part of Harris County, which abuts on Galveston Bay and is traversed by several streams whose courses here and there are expanded into long, rather narrow lakes of irregular outline. The

surface of the upland is nearly flat, and the highest parts of it stand only a little more than 30 feet above the sea.

Stuebner. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, $30^{\circ} 7' 30''$ to $30^{\circ} 15'$; longitude, $95^{\circ} 30'$ to $95^{\circ} 37' 30''$.

Only a small part of this quadrangle, about 12 square miles, is shown on the map, which covers the extreme northern part of Harris County in great detail by contours 1 foot apart. The altitude ranges from about 105 feet in the valley of Spring Creek to 185 feet on a hill near Stuebner.

Swanson. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. Latitude, $29^{\circ} 52' 30''$ to 30° ; longitude, $95^{\circ} 45'$ to $95^{\circ} 52' 30''$.

Map of part of the plain of Harris County, in eastern Texas. The greatest difference in elevation in the area is less than 80 feet, the difference between the tract north of Cypress Creek, some of whose hills rise to elevations of nearly 225 feet, and the valley of Bear Creek, in the extreme southern part of the area, whose lowest point is 145 feet above the sea. The region includes numerous more or less circular depressions, some of which contain small ponds or intermittent lakes.

Weeden. Scale, 1 inch= $\frac{1}{4}$ mile; contour interval, 1 foot. (Part of quadrangle.) Latitude, 30° to $30^{\circ} 7' 15''$; longitude, $95^{\circ} 15'$ to $95^{\circ} 22' 30''$.

Map of part of San Jacinto River and of its tributary Spring Creek, which forms the northern boundary of Harris County, and the dissected plain to the south. The town of Humble, which has sprung up owing to the discovery of oil in certain of the rocks that underlie part of the region, is the only settlement indicated.

Virginia.

Cape Henry. Scale, 1 inch=1 mile; contour interval, 5 feet. Latitude, $36^{\circ} 45'$ to 37° ; longitude, $75^{\circ} 56'$ to $76^{\circ} 15'$.

Map of the region adjacent to Cape Henry, the southern headland at the entrance of Chesapeake Bay, a splendid illustration of the diverse topographic forms produced by the sea; the wind, and the broad movement of the land with respect to the sea. The unique feature of the map is the series of dune ridges and beaches that form the triangular tract near whose northern apex stands the Cape Henry lighthouse.

Ivor. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 45'$ to 37° ; longitude, $76^{\circ} 45'$ to 77° .

Map of parts of Southampton, Isle of Wight, Sussex, and Surry counties, in southeastern Virginia. This region is part of a dissected plain whose uplands, large areas of which are practically flat, stand at an elevation of about 90 feet. None of the rivers have well-marked valleys, and the courses of most of the smaller streams are bordered by swamps.

Jarratt. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 45'$ to 37° ; longitude, $77^{\circ} 15'$ to $77^{\circ} 30'$.

Map of part of Sussex, Dinwiddie, Greensville, and Southampton counties, in southeastern Virginia, a region of low relief whose highest points are not 150 feet above the sea. Swamps occur in the valley plain and along most of the small streams. The relatively flat uplands are better drained and are followed by the roads.

King William. Scale, 1 inch=1 mile; contour intervals, 10 and 20 feet. Latitude, $37^{\circ} 30'$ to $37^{\circ} 45'$; longitude, 77° to $77^{\circ} 15'$.

Map of part of the Coastal Plain in eastern Virginia 10 to 25 miles east of Richmond. The notable topographic features of the area are the broad-floored valleys of Mattaponi and Pamunkey rivers and the flat-topped dissected upland north and south of these valleys. The flatness of the upland

is especially evident in the territory between these rivers. The highest point in the area mapped is about 180 feet above sea level, but most of the upland stands at elevations between 120 and 150 feet.

New Kent. Scale, 1 inch=1 mile; contour interval, 10 and 20 feet. Latitude, $37^{\circ} 30'$ to $37^{\circ} 45'$; longitude, $76^{\circ} 45'$ to 77° .

Map of the junction of Pamunkey and Mattaponi rivers, in southeastern Virginia, and the dissected adjacent low plain. Both streams flow in meandering courses on a marshy floor, above which a terrace rises to an elevation of 20 to 30 feet, and above the terrace rise rather steep slopes, leading to the flat-topped uplands, which stand at an elevation of about 120 feet.

Surry. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, 37° to $37^{\circ} 15'$; longitude, $76^{\circ} 45'$ to 77° .

Map of part of James River and the coastal plain through which it flows. Near the main river and the larger streams the plain is much dissected by ravines and small valleys, but farther away there are tracts, some of them several square miles in extent, whose surface shows differences of elevation of less than 10 feet.

Virginia-North Carolina.

Boykins. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 30'$ to $36^{\circ} 45'$; longitude, 77° to $77^{\circ} 15'$.

Map of parts of Southampton County, Va., and Hertford and Northampton counties, N. C., a region considerably dissected by streams, though the tops of its uplands, especially in its eastern part, are nearly flat and seem to be remnants of an eastward-descending plain that stands at an elevation of 80 to 95 feet. In addition to this plain a higher, more dissected one is represented by gently rounded ridge tops that stand at an elevation of about 130 feet. A lower and almost perfectly flat surface at an elevation of 30 to 35 feet forms a terrace which is a prominent feature along the principal streams. Nottoway and Meherrin rivers generally flow in broad, flat valleys cut in the lower plain, and the bottoms of these valleys are swampy and less than 20 feet above the sea.

Emporia. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 30'$ to $36^{\circ} 45'$; longitude, $77^{\circ} 30'$ to $77^{\circ} 45'$.

Map of part of Brunswick and Greenville counties, Va., and Northampton County, N. C., a region in the western part of the Coastal Plain province and the eastern part of the Piedmont province where hard rocks are exposed at the surface. The ponding of Meherrin River by the dam built a short distance west of Emporia is a notable feature of the region.

Holland. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 30'$ to $36^{\circ} 45'$; longitude, $76^{\circ} 45'$ to 77° .

Map of parts of Nansemond, Southampton, and Isle of Wight counties, in southeastern Virginia, and Gates and Hertford counties, in northeastern North Carolina. Most of the region is a somewhat dissected plain traversed by Chowan River and its two large branches, Nottoway and Blackwater rivers, and their tributaries. Practically no point in this area stands more than 100 feet above the sea.

Suffolk. Scale, 1 inch=1 mile; contour interval, 10 feet. Latitude, $36^{\circ} 30'$ to $36^{\circ} 45'$; longitude, $76^{\circ} 30'$ to $76^{\circ} 45'$.

Map of part of the region southwest of Norfolk, including the western margin of the Dismal Swamp and the dissected plain to the west. A rather abrupt slope borders the swamp, whose surface stands 20 to 30 feet above the sea, and leads from it to nearly flat uplands, whose surface stands 60 to 70 feet above the sea.

Washington.

Port Crescent. Scale, 1 inch=1 mile; contour interval, 25 feet. Latitude, 48° to $48^{\circ} 15'$; longitude, $123^{\circ} 30'$ to $123^{\circ} 45'$.

Map of part of Juan de Fuca Strait and the foothills of the Olympic Mountains, to the south, in Clallam County. Many of the peaks, though not more than 10 miles distant from the strait, rise to elevations above 5,000 feet. The slopes of the hills are so steep that on the map most of the intermediate contours for elevations above 1,000 feet are omitted and only the accented contours are shown. As a result the same effect is produced as if a 100-foot contour interval had been used for the mountains.

Van Zandt. Scale, 1 inch=1 mile; contour interval, 50 feet. Latitude, $48^{\circ} 45'$ to 49° ; longitude, 122° to $122^{\circ} 15'$.

Map of part of mountainous region of northwest Washington, including the international boundary and the country south of it. It represents a region of strong relief, whose highest peaks rise to elevations of nearly 5,000 feet and some of whose lowlands are not more than 250 feet above the sea. Nooksack River, the largest stream, follows an exceedingly irregular course, which does not everywhere correspond to the largest valley. In fact, "Columbia Valley," which is a broad-floored valley extending from the international boundary to one of the great bends of Nooksack River, has no large stream in it. The present intricate arrangement of the drainage lines is probably due to the former glaciation of much of the region.

Wyoming.

[See Colorado-Wyoming.]

GEOLOGIC BRANCH.

SCOPE AND ORGANIZATION OF WORK.

The geologic work of the Survey comprises all phases of geology, including stratigraphy, structure, petrology, paleontology, physiography, glaciology, metallography, mineralogy, chemistry, and physics, as well as a census of the country's mineral resources. It includes also special investigations made for other departments of the Government or for commissions, States, and municipalities. The results of nearly all these investigations are made public in printed reports, some of which are published by cooperating organizations or in professional or technical journals.

The geologic branch consists of four divisions:

1. The division of geology, Sidney Paige, geologist in charge, conducts areal geologic surveys and special economic investigations and researches. It is also engaged in preparing the geologic map of the United States, and through field examinations it cooperates in the classification of the mineral lands of the public domain.

2. The division of Alaskan mineral resources, A. H. Brooks, geologist in charge, carries on topographic, hydrologic, and geologic surveys in Alaska. To render more efficient assistance to the development of the resources of Alaska a branch office is maintained the year around at Anchorage.

3. The division of mineral resources, Edson S. Bastin, geologist in charge until January, G. F. Loughlin, geologist in charge since January, keeps the public informed as to the state of the mineral industries and the rate of production of mineral commodities in the United States. This division also compiles and prepares for publication information concerning foreign mineral deposits—their geology, quality, reserves, state of development, output, and trade distribution. Branch offices of this division are maintained at San Francisco, Salt Lake City, and Denver.

4. The division of chemical and physical research, George Steiger, chief chemist, acting in charge, makes the chemical analyses that are essential to the work of the geologic branch and conducts physical and chemical researches bearing upon geologic problems.

The scope of the work and the activities of these divisions are more fully described in their respective reports, given below.

DIVISION OF GEOLOGY.

ORGANIZATION AND PERSONNEL.

The scientific force of the division of geology at the beginning of the fiscal year consisted of 80 geologists, 22 associate geologists, 18 assistant geologists, 3 junior geologists, and 6 geologic aids. During the year 15 geologists resigned to take professional positions in commercial life at higher salaries, 1 died, 3 returned from the Army, 12 were appointed, and 2 were transferred from another division. The total number of geologists in the division at the end of the year was 130, a net gain of 1. Nine of these were appointed as geologic aids or assistant geologists near the end of the year.

The division is organized in 12 sections, named below, and it also exercises administrative supervision of the section of geologic map editing, a part of the publication branch. The principal activities of the sections are described in the annual reports for 1917 (pp. 43-47) and 1919 (pp. 60-64).

1. The section of eastern areal geology, Arthur Keith, geologist in charge.
2. The section of western areal geology, Sidney Paige, geologist in charge.
3. The section of Coastal Plain investigations, T. Wayland Vaughan, geologist in charge. The subsection of sedimentary investigations, E. W. Shaw, geologist in charge.
4. The section of glacial geology, W. C. Alden, geologist in charge.
5. The section of paleontology and stratigraphy, T. W. Stanton, geologist in charge.
6. The section of geology of metalliferous deposits, F. L. Ransome, geologist in charge.
7. The section of petrology, E. S. Larsen, jr., geologist in charge.

8. The section of geology of iron and steel alloy metals, E. F. Burchard, geologist in charge.

9. The section of the geology of nonmetalliferous deposits, H. S. Gale, geologist in charge.

10. The section of the geology of eastern coal fields, G. H. Ashley, geologist in charge until September 4, when its administration was united with that of the section of the geology of western coal fields.

11. The section of the geology of western coal fields, M. R. Campbell, geologist in charge.

12. The section of the geology of oil and gas fields, nominally in charge of the chief geologist, but with K. C. Heald, assistant chief of section, acting in charge.

The committee on geologic names, T. W. Stanton, chairman, during the year examined 86 manuscripts, comprising 11,667 pages and involving 2,240 geologic names. In addition a large amount of work was done on the stratigraphic catalogue of the United States, and progress was made on the stratigraphic lexicon.

PUBLICATIONS.

Nine professional papers and three chapters of a tenth paper were issued during the year. Five complete bulletins, 22 parts of five other bulletins, and two geologic folios were published. Titles and brief abstracts of these publications are given on pages 12-30. In spite of the large size of the original editions it was found necessary to republish one professional paper, two bulletins, and 17 parts of two other bulletins to meet the public demand. Besides the official publications 49 papers were, with the permission of the Director, published by scientific societies or in scientific and technical journals. Nine reports based on work done in cooperation with State geological surveys have been transmitted to the States for publication.

PROGRESS OF GEOLOGIC MAPPING.

The areas in the United States¹ covered by geologic maps published by the Survey and the general nature of the work in each area are shown in the map forming Plate I. This map does not, however, indicate areas on which reports prepared by this Survey have been submitted for publication to cooperating State organizations of to other bureaus and departments of the Federal Government.

The resumption of normal geologic work being dependent on the completion of reports on investigations of war minerals and the preparation of reports on field studies made before the war, a considerable part of the geologic staff was occupied with office work during the year, and the areas covered by field investigations were therefore

¹ The progress of geologic surveying in Alaska is shown on page 92.

less than those that would otherwise have been covered even with the reduced staff. A summary statement of the work is given below:

Progress of geologic mapping, fiscal year 1919-20.

	Square miles.
Detailed mapping	5, 250
Reconnaissance mapping	14, 480
Exploratory mapping	32, 780
	<hr/> 52, 510
Lands classified	4, 375

FINANCIAL STATEMENT.

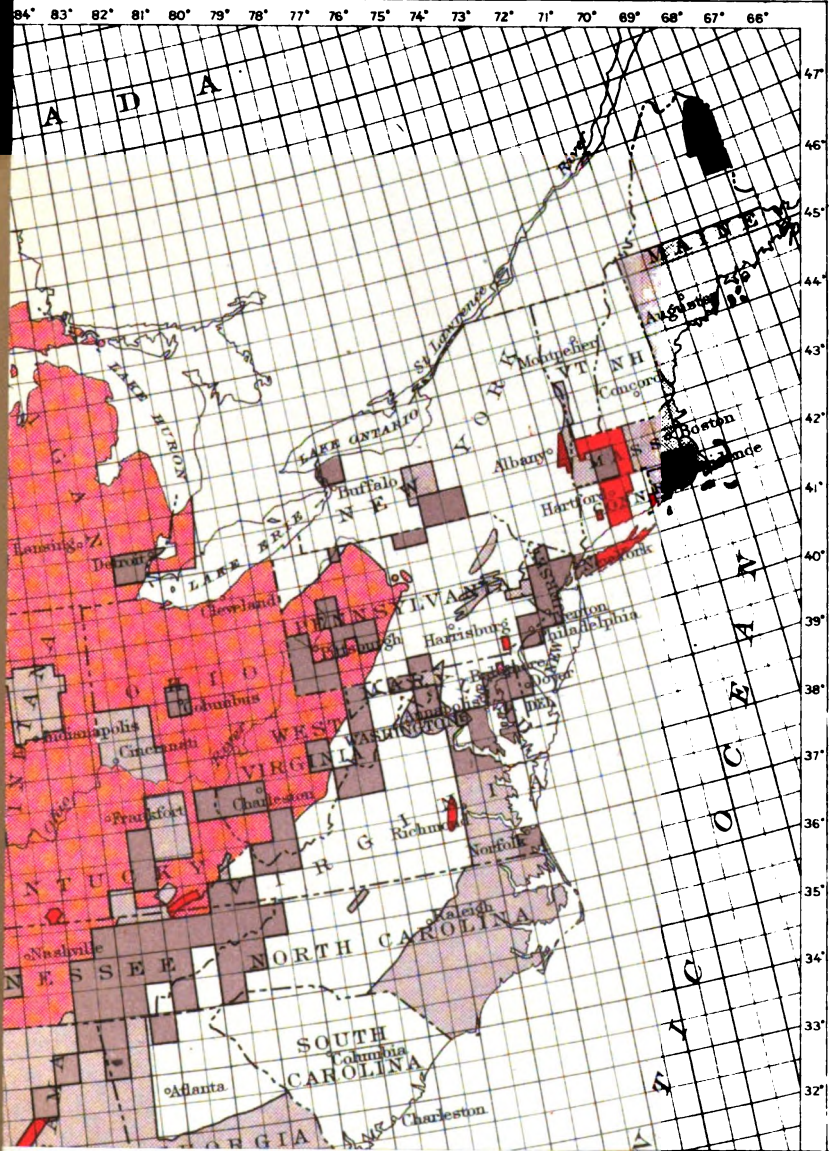
The total funds available for the geologic work of the Survey in the United States for the fiscal year 1919-20 were as follows:

Geologic surveys	\$347, 073. 50	
Repayments	2, 914. 46	
	<hr/>	\$349, 987. 96
Scientific assistants		11, 700. 00
Search for potash deposits (part of appropriation for chemical and physical researches)		5, 974. 66
		<hr/> 367, 662. 62

The authorized expenditures, classified by subjects, were approximately as follows:

Economic geology of metalliferous deposits (mainly war minerals)	\$58, 129. 00
Economic geology of nonmetalliferous deposits (mainly potash, nitrates, and war minerals)	33, 960. 00
Economic geology of fuels (oil, gas, coal, and peat)	69, 886. 00
Geographic handbooks and related educational work	3, 626. 00
Scientific researches not directly connected with eco- nomic purposes (paleontology, etc.)	88, 020. 00
Supervision, administration, salaries of clerical, techni- cal, and skilled-labor forces, instruments, and sup- plies	93, 185. 00
Land-classification board	20, 856. 00
	<hr/> 367, 662. 00

Of the amounts allotted to this division, \$64,597 was used directly for field expenses, including the search for potash. About 66 per cent of this amount was expended west of the one hundredth meridian and about 34 per cent east of it. With the \$20,856 appropriated for the operations of the land-classification board, 74 per cent of the total, exclusive of the allotment for supervision, was spent for investigations west of the one hundredth meridian—that is, essentially in the public-land States. The expenditures for supervision, etc., are divisible between the eastern and western work in about the same proportion.



COOPERATION.

The requests for cooperation have involved more work than ever before, and, as far as possible, they have received prompt response. It is regretted, however, that on account of the reduced staff of qualified geologists six requests received from State geological surveys for cooperation, with offers of equal contribution to the cost of the work, could not be granted.

As usual, effective cooperation has been maintained between the division of geology and other divisions, particularly the divisions of mineral resources and Alaskan mineral resources. The paleontologic work in Alaska is largely cared for by the paleontologists of the division of geology. The cooperation of the division of chemical and physical research with other divisions of the geologic branch is fundamental and continuous. Within the department frequent cooperative assistance has been rendered to other bureaus, notably the Bureau of Mines, the Office of Indian Affairs, and the General Land Office.

The division of geology, through the preparation of special reports or through special examinations, has cooperated with the War Department, the Navy Department, the State Department, and the Department of Justice; with the United States Public Health Service, the Office of the Supervising Architect, and the Bureau of Internal Revenue in the Treasury Department; with the Bureau of Standards, the Bureau of Fisheries, and the Bureau of Foreign and Domestic Commerce in the Department of Commerce; and with the United States National Museum, the Carnegie Institution, the American Museum of Natural History, the Brooklyn Museum of Natural History, the Museum of Natural History of Paris, and the Geological Survey of Canada. Investigations have been undertaken at the request of the governments of the Virgin Islands, Porto Rico, the Dominican Republic, and the Republic of Haiti. Assistance has been given also to the geologic departments of a number of American universities and colleges.

In strictly geologic investigations or paleontologic studies the Survey, through the division of geology, has cooperated with the geological surveys or equivalent agencies in 29 States—Arizona, Arkansas, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Jersey, New York, North Carolina, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Virginia, Washington, West Virginia, and Wisconsin. Informal cooperation exists between the Survey and all States having geological surveys. Co-operative assistance has also been rendered to the cities of Dallas, Tex., and Shreveport, La.

GENERAL REVIEW OF THE WORK OF THE YEAR.

Loss in efficiency and morale of the scientific staff.—The year 1919–20 has been one of unprecedented stress in the geologic branch and in the division of geology in particular. A scientific staff already depleted on account of inadequacy of salaries has been further reduced until in four of the sections there are not enough experienced geologists left to train the recruits enlisted to replace men lost. A number of geologists who had patriotically remained in the service after the declaration of the armistice, notwithstanding the difficulty of meeting the rising cost of living and the inconvenience of carrying on scientific work in wholly inadequate quarters, have resigned. In addition to 15 geologists who have left the service, 19 geologists have taken leave without pay for parts of the year in order to earn in other employment enough money to make their incomes equal to the necessary expenditures of ordinary living. Among those who have resigned are B. S. Butler, E. C. Harder, D. E. Winchester, D. Dale Condit, Edwin Kirk, E. T. Hancock, and E. L. Jones, jr. The universities, offering more inviting salaries, as well as long vacations, sabbatical years, opportunities for private practice, and reassuring retirement prospects, have united with the oil and mining companies in taking from the Survey some of its best geologists. Three well-known specialists, E. S. Bastin, J. B. Umpleby, and Adolph Knopf, have taken university chairs, and three others have been granted leave of absence to teach at higher salaries for a part of the year. The changes in the personnel in the divisions of Alaskan mineral resources, chemical and physical research, and mineral resources are noted in the reports of the chiefs of those divisions. The greatest breakdown of the staff of the division of geology has been suffered by the coal, oil, and metal sections, the first of which was nearly wiped out. In view of this deplorable disintegration of its force the Survey is fortunate in that the impairment of the morale of its scientific staff has not been greater.

The extent of the work has been limited by the greatly increased cost of field operations, as well as by the loss of highly trained geologists. The continued advance in the wages of temporary field assistants and laborers, prices of equipment, provisions, and other supplies, storage and keep of animals, living rates, and traveling expenses has not been covered by any increase in the funds appropriated. The loss of a geologist of large experience in professional work and of special knowledge of a particular kind is a loss of years of training in methods of geologic research, in the standards of execution of Survey work, and in the production of reports. The expert knowledge of a particular subject or of a special field, gathered in the course of a professional career in the Survey, is an asset of notable public value. The resignation of a geologist may leave a

project unfinished or a report incomplete, whose completion may require the duplication of the greater part of the field investment and the assignment to the project of a less experienced geologist. Obviously it may also involve great loss of time, which is the equivalent of money. The Government loses further by having to pay relatively higher salaries for new men of less experience and inferior qualifications, while at the same time it must sacrifice a part of the efficiency of the remaining specialists, either by requiring them to perform administrative work or by assigning to them the work of training recruits in technical work or in the preparation of reports. The scientific output of several of the leading members of the field staff has been seriously or totally interrupted by their enforced assumption of administrative responsibilities.

Some of the losses sustained by the lack of suitably trained geologists to take charge of projects that are already in progress and that are of large value to the public are mentioned in the description of the work by States. In some regions urgently needed geologic investigations have been definitely suspended. Requests for cooperative work received from six States—Florida, Georgia, Tennessee, Kentucky, Pennsylvania, and Michigan—could not be granted.

Principal work done.—After finishing its studies of war minerals and other studies of military importance the Geological Survey resumed its normal work. During the year economic reports on deposits containing manganese, chromite, tungsten, helium, white clays, mica, asbestos, magnesite, mercury, and peat have been submitted, printed, or nearly completed. Theoretical contributions also, carrying forward our knowledge of the mode of occurrence and genesis of some ores, have been by-products of the war studies.

Several of the broader investigations, of both economic and of constructive scientific value, begun before the war have been revived, completed, or published. Examples are F. L. Ransome's work on the copper deposits of the Ray and Miami districts, and B. S. Butler's studies of the ore deposits of Utah, which have been embodied in Professional Papers 115 and 111, respectively. A folio on the Ray quadrangle has been submitted by Mr. Ransome, who is now working on a paper on the mining districts of Arizona, and Mr. Butler (resigned in June), assisted by F. C. Calkins, has been carrying forward detailed examinations of the geology and ore deposits of the Cottonwood district, Utah. A valuable paper on primary sulphate minerals and ore deposits, unofficially published by Mr. Butler, is the outgrowth of his years of study of western ore deposits, chiefly copper.

Arrangements have been made by which Mr. Bastin will continue his studies of silver enrichment. Sidney Paige has finished his report

on the Tyrone district, in New Mexico, and Adolph Knopf and H. G. Ferguson resumed their studies of the Rochester, Divide, and Manhattan districts, in Nevada, and of the Mogollon district, in New Mexico, and have completed their reports. F. C. Schrader is reviewing his recent field mapping and economic work in the Carson City quadrangle in Nevada. Mr. Umpleby, since he left the service, has completed a report on the Shoshone district, in Idaho, and F. B. Laney and D. C. Livingston are carrying along the detailed study of the Seven Devils and Sawtooth districts, also in Idaho, Mr. Livingston representing the State.

Among the noteworthy work of the geologists of the nonmetals and fuel sections is a study by G. R. Mansfield of the greensands of New Jersey. A classification of coals prepared by G. H. Ashley prior to his acceptance of the more remunerative position of State geologist of Pennsylvania includes new evidence as to the origin of coal. Papers by A. E. Fath on the Eldorado oil field, Kans., and on the origin of the minor folds and faults in the oil region of southeastern Kansas and northeastern Oklahoma are valuable contributions to the geology of oil and gas. D. F. Hewett, in the course of his detailed geologic and structural mapping of possible oil territory in the southern part of the Big Horn Basin, is working out the history of a newly discovered thrust known as the Hart Mountain fault, which appears to exceed in extent the Lewis overthrust, in northern Montana, and may perhaps rival the Bannock thrust, in southeastern Idaho.

The examinations of the Mid-Continent and Appalachian natural-gas fields made by the late G. S. Rogers in the interest of the military and the naval service have resulted in a compilation of all available information regarding the occurrence and distribution of helium in natural gas as well as an appraisal of the commercial resources of helium in the natural gases of the United States. The results of the work are given in Professional Paper 121, now in press.

A bibliography of the metals of the platinum group, 1748-1917, by Jas. Lewis Howe and H. C. Holtz, has been issued as Bulletin 694.

Field studies of reported deposits of potash and nitrate in the Pacific Coast States and in the Southwest, by H. S. Gale, L. F. Noble, and G. R. Mansfield, not only contribute to our knowledge of the potash and nitrate resources of the United States but combine to form an analytical determination of the physiographic, climatic, rock, soil, and water conditions that control the mode of occurrence of nitrates and potash salts in the western Pleistocene and Recent lake basins.

Studies of the stratigraphy, extent, and geologic history of the salt deposits in the "Red Beds" of the Southwest, made by N. H. Darton in search for associated deposits of potash salts and reported in a manuscript on the Permian salt deposits of United States,

yielded valuable by-products consisting of a topographic base map and a reconnaissance geologic map of New Mexico on a scale of 4 miles to the inch. A similar by-product is a new geologic map of Wyoming on a scale of 1:500,000, prepared under the direction of M. R. Campbell to accompany a report by W. B. Emery giving the results of examinations of coal and possible oil lands in Wyoming for the purpose of classification. Details of stratigraphic and areal geology in Montana, gathered mainly in a similar examination of lands, are now being cooperatively contributed to the Montana State Bureau of Mines for incorporation in a large-scale geologic map to be issued by that bureau. Another State map compiled by the Geological Survey is a general geologic map of Utah on a scale of 12 miles to the inch, contained in Professional Paper 111. A reconnaissance geologic survey of parts of eastern Arizona is now being made by Mr. Darton in cooperation with the State School of Mines, to obtain data for a complete geologic map of that State.

On the other hand, the investigation of the stratigraphy, extent, and composition of the oil shales and of the reported coal deposits of northern Nevada made in 1918 and the examination of the Tertiary basins east of the Cascade Mountains in Oregon made in 1919 to determine their depth, structure, and possible content of oil may be regarded merely as by-products of a comprehensive study of the physiographic, geologic, and climatic history of the fresh-water Tertiary lake basins of the Northwest and of their relations to the great tectonic and volcanic phenomena of late Tertiary and early Pleistocene time. At the request of the Idaho Bureau of Mines and Geology similar studies were begun in June in western Idaho to determine the possibility of developing commercial oil or gas resources in that part of the State.

The paleontologic investigations of the oil shales of the Green River group in and around the Uinta Basin and of the Miocene basins in Nevada, begun by the late C. A. Davis, were resumed by Harvey Bassler, a young geologist specially qualified to determine the origin of the shales and the sources of their hydrocarbons, but Mr. Bassler had only begun his work when he resigned to make structural studies in South America for investors seeking oil and gas. It is regrettable that the examinations of these shales, on which the United States may be compelled to rely for oil, have been again suspended, this time on account of inadequate Government salaries.

Tests of the applicability of refined methods of magnetic surveying to prospecting for pyrrhotitic copper ores were made in November by W. O. Hotchkiss, State geologist of Wisconsin, an expert in magnetic surveys, and Adolph Knopf, of this Survey, at Ducktown, Tenn. The results, though not decisive, indicate that these methods

may be useful in the search for ores even so feebly magnetic as those at Ducktown, but the practical value of these tests and of those to be made in other regions can be determined only after they have been compared with the results shown by mining.

A report by E. C. Harder on iron-depositing bacteria and their geologic relations, based largely on a study of the iron ores of the Cuyuna range, Minn., published early in the year as Professional Paper 113, has already been reprinted to satisfy the public demand.

In addition to geologic researches that are applicable mainly to economic problems but that yield what has been called "purely scientific" by-products, researches were made in the field of "pure" geology, which, however, can not properly be detached from work of economic application. Among the members of the Survey staff no sharp distinction is made between "economic" and "scientific" researches.

In glacial geology W. C. Alden is studying the drift of the foothills and plains along the northern Rocky Mountains for the purpose of connecting and of correlating more definitely the glacial history of the mountain country of the Northwestern States with the more fully elaborated history of the region east of the Mississippi. The study of the glacial history of the Sierra Nevada has been begun by F. E. Matthes, and the recent work of Frank Leverett on the morainal systems, old shore lines, differential movements, soils, and former drainageways of the northern Lake States is now brought to fruition in a manuscript that forms an important addition to the records of the glacial history of North America under the title "The moraines and shore lines of the Lake Superior basin."

The study of the basins of the fresh-water lakes of western Montana, already begun by J. T. Pardee, was resumed by him in June. His work includes the investigation of the glacial deposits and their relations to the lake basins and to the formation of the placer deposits; of the comprehensive problems of the history of these basins, including the origin and conditions of deposition, erosion, deformation, and drainage; and of the origin, age, and correlation of the terrace systems of Columbia River. The results of this study and of that of J. P. Buwalda, of the United States Geological Survey, and the geologists of the University of California should together serve to work out the history and the relations of the Tertiary fresh-water basins of the Northwest, the sources of their sediments and the conditions of sedimentation, their relations in time to the Columbia and Snake River lava systems, their place in the physiographic history of the northwestern Rocky Mountains and northern Great Basin, and their relations in time to the origin of the different structural features, including the later fault systems, so many of which

are being worked out by geologists examining deposits of ores and fuels.

The work of the paleontologists, though their field examinations were curtailed during the war, has this year been prosecuted under favorable conditions and, as usual, forms an essential part of the Survey's scientific activities. Fortunately, the services of the paleontologists are not sought by the oil companies so persistently as the services of the geologists; only one member of the staff has been lured away. The details of the Survey's paleontologic work is given in the accounts of operations of the divisions by States. Only a few of the larger projects and productions can be mentioned here. Contributions to our knowledge of Tertiary Bryozoa were prepared under Survey auspices by F. Canu and R. S. Bassler, though published by the United States National Museum. F. H. Knowlton's catalogue of Mesozoic and Cenozoic plants of North America has been issued as Bulletin 696, and his monographic paper on the Laramie flora of the Denver Basin, which has long been needed, is now in preparation for publication as Professional Paper 130. A report by E. W. Berry on the Upper Cretaceous floras of the eastern Gulf region in Tennessee, Mississippi, Alabama, and Georgia has been published as Professional Paper 112, and Mr. Berry has submitted for publication a report on the Eocene flora of southeastern North America. Other paleontologic investigations in progress are studies of fossil floras by Messrs. Knowlton and Berry, of the invertebrates of the Morrow and other Carboniferous formations by G. H. Girty; of the Mollusca of the west-coast Tertiary, by W. H. Dall; and of the Foraminifera of the Cretaceous and Tertiary of the Gulf and Caribbean regions, by J. A. Cushman. A paper on some American Jurassic ammonites, by J. B. Reeside, jr., has appeared as Professional Paper 118. A description of a remarkable fauna from the Ripley formation in west Tennessee, by Bruce Wade, was cooperatively contributed without expense to the Survey other than that involved in the preparation of the illustrations.

T. W. Stanton has made progress in his work on the Comanche faunas of the Southwest, and the Survey is cooperating with the University of California in work on Prof. J. P. Smith's monograph on the Triassic ammonites of the Pacific coast region. The study by E. O. Ulrich of the stratigraphy, paleontology, and paleogeographic history of the formations comprising or in contact with the groups for which he proposes the terms "Ozarkian" and "Canadian" as names of Paleozoic systems is still engaging his attention. He has also completed a monographic study of the trilobites belonging to the family Lichadiidae.

Paleontologic researches relating to the origin and distribution of the faunas of the Caribbean and Central American provinces,

including the Gulf Coastal Plain region of the United States, somewhat fully outlined in the Fortieth Annual Report, have been continued by T. W. Vaughan. The work on the geologic history of this part of the Western Hemisphere is naturally being pushed with greatest energy in the American insular possessions and in the Republics of Santo Domingo and Haiti, where cooperative geologic surveys have been organized under the direction of the United States Geological Survey, the geologic work being done under the supervision of Mr. Vaughan. These surveys, which are undertaken primarily to determine the geologic structure and mineral resources of the countries, have already afforded good results, which promise to make it possible to fix the geologic dates of periods of mountain building by folding and block faulting, to define the successive periods of greater igneous activity, and to correlate in time the geologic and paleontologic events in the regions studied with corresponding events in the United States, as well as in other parts of the world.

The most notable paleontologic work completed during the year is a monograph on the Titanotheres, by Henry Fairfield Osborn, distinguished among world paleontologists and president of the American Museum of Natural History. This work is a product of a study begun nearly 20 years ago by the Survey and now completed under its auspices, with the cooperation of the American Museum of Natural History and the United States National Museum and through the courtesy of many other scientific institutions. This monumental work forms a milestone in the progress of paleontologic research in North America.

The publication of geologic folios, suspended during the war, is now again going forward. Two folios have been completed during the year, two are now in press, and the engraving of maps for three others is in progress. A large number of folio manuscripts, nearly ready for publication, have accumulated. Most of these antedate the war, and the delay in their publication is to be regretted, especially on account of the resignation of some of the authors. Field investigations and conferences relating to correlation, to features of structure, and to other elements necessary to the completion of texts and maps to cover quadrangles in Alabama, Tennessee, Virginia, and southeastern Pennsylvania have been made, and a considerable number of manuscripts should be ready for transmission early in the coming year, but the geologic force is at present quite inadequate to insure the immediate completion of work covering many quadrangles, from some of which it has been necessary to transfer the field geologists to other more pressing projects.

The studies of the areal, igneous, and structural geology, the geologic history, and the physiography of the San Juan region of Colo-

rado, resumed in 1918 and 1919, is now progressing rapidly, Whitman Cross, W. W. Atwood, E. S. Larsen, and C. S. Ross having returned to the field again in June, with the prospect of completing the field work in the summer of 1920. Progress has been made in the preparation of the group of reports that will embody the results of the investigation of the San Juan region. A report on the microscopic determination of nonopaque minerals, by Mr. Larsen, is now in press as Bulletin 679.

The material assembled by the late Arnold Hague for incorporation in a monographic description of the Yellowstone Park appears to be nearly complete, though additional field studies of the work of the glaciers and the preparation of descriptions and maps are needed. No one is now available, however, to make the necessary additional field examinations and perform the relatively small amount of labor required to prepare the report for publication.

As one of the products of his years of study of the stratigraphy, structure, and geologic history of the older Paleozoic and metamorphic belts of the northern Appalachian region, Arthur Keith is preparing a report on the structure of the Taconic Range, in western New England and New York.

A report by G. R. Mansfield on detailed examinations of several quadrangles in southeastern Idaho is nearly ready for transmission for publication as a professional paper.

Two geographic handbooks, one on the New England States and the other on the region including Virginia, Maryland, and Delaware, will be completed before the end of 1920. The scope and the character of these two reports, which were begun in cooperation with the Council of National Defense, were modified when it became apparent that the war would not be brought to the coast of the United States and that the need for geographic information especially prepared for military use was not immediate. Accordingly, the field examinations have been extended and the texts revised or rewritten to make these handbooks available for popular education.

Other geographic books designed to furnish instruction in popular form as to the scenic and other features of the country and their origin are the guide to the Denver & Rio Grande Railroad from Denver to Salt Lake by Mr. Campbell and the popular guide to the Yosemite Valley region by Mr. Matthes. Texts describing in popular language the salient features of some quadrangles of unusual interest for which new topographic maps are issued are now in preparation, and it is hoped that they may assist in affording a better understanding of the nature and origin of the topographic features shown on the maps.

To assist in the understanding of the conditions of geologic deposition and in the determination of geologic history the Survey has

endeavored to build up a sedimentary laboratory and to encourage a study of sedimentation both by developing specialists and by stimulating the interest of geologists, in and out of the Survey, in that subject. In this study the drillings from wells sunk in search of potash in the Black Rock and Smoke Creek desert playas of northern Nevada were examined some time ago by M. I. Goldman. During the last year Mr. Goldman's work has been aided by the better equipment of the sedimentary laboratory and by its organization as a subsection in charge of E. W. Shaw, who has given much time to researches in sedimentation. This subsection is a part of the section of Coastal Plain investigations, which is under the general supervision of T. W. Vaughan. Several geologists, notably C. K. Wentworth and the paleontologists who are working on microscopic faunas, are now cooperating in this work, which is being coordinated with similar work done in several laboratories under university auspices.

The observations of gravity made in cooperation by the Geological Survey and the Coast and Geodetic Survey have been limited in number and in geographic extent by delays incident to the construction of new types of apparatus that will permit greater mobility of equipment and the establishment of stations out of contact with direct telegraphic connection. Most of the stations occupied are at points chosen for the purpose of checking and confirming several anomalies of gravity that have been inexplicable or of observing the amount of the anomalies where the known stratigraphy and structure furnish satisfactory data for determining the gravity at closely contiguous points that afford widely contrasting results. Observations of the force of gravity at a considerable number of points in different regions, carefully chosen to determine the effects of known thicknesses of light-gravity rocks at the surface or of known contrasting conditions resulting from faulting or folding, may afford criteria that will not only be of use in interpreting anomalies not yet explained but will be of practical service in the formulation of deductions as to the probable thickness of the unaltered and relatively light rocks in parts of the country where the distance to the basement complex or underlying metamorphic and crystalline rocks is not known. The pendulum may thus eventually be of service in studies of geologic history as well as in studies of isostasy.

The division of geology has cooperated with the division of chemical and physical research in observations of temperature at different depths in a number of deep wells drilled in the Appalachian, Mid-Continent, and Rocky Mountain oil fields. These measurements of the temperature of deep wells by Mr. Van Orstrand are more accurate than any heretofore made, and their accumulation will afford a means of showing the temperature gradient of the outer strata of

the crust of the earth in different parts of the United States. These observations will also show whether the temperature of oil-bearing areas is greater than that of the surrounding regions and whether the temperature of the rocks in the more strongly folded anticlines is greater than that of those in the horizontal beds on either side. Studies and tests of the relations of sizes of grains and pore spaces of oil sands to the volume and duration of their productivity are now being made by A. E. Melcher. It is much to be regretted that the funds available and the scientific staff of the physical laboratory are not adequate for the solution of many other problems connected with the origin, migration, and conditions of occurrence of oil and natural gas. Progress in oil geology is now greatly retarded by the lack of work in experimental physics to solve questions connected with the discovery and the extraction of oil, as well as with its most efficient utilization.

A special public service, appropriate to peace, is exemplified in the work of the Director and F. G. Tryon in their effort to assure the adequacy of the coal supply, both by maintaining the special information service covering the production, distribution, and reserves from week to week and by urging the greater conservation of coal through its more efficient utilization and through the substitution, where practicable, of power generated by water for power generated by coal. Through unofficially published articles and addresses the Director, Eugene Stebinger, and the chief geologist have endeavored not only to give warning of the prospective rapidly increasing dependency of the United States on foreign oil but to point out, through discussions of the distribution of prospective oil fields in other parts of the world and estimates of the great foreign reserves, the fact that only a part of the world's store of oil is controlled by or accessible to citizens of our own country.

WORK OF THE DIVISION, BY STATES.

ALABAMA.

Several points of large mineral production in northern Alabama were visited by the Director in September in company with the Association of American State Geologists.

The folios covering the Bessemer, Vandiver, Columbiana, and Montevallo quadrangles, in Alabama, have been reviewed and partly rewritten by Charles Butts, who revisited a number of critical points. Field observations of the older Paleozoic rocks in the Birmingham district, notably those of the Ordovician and Silurian systems, were made for regional correlation by E. O. Ulrich and Mr. Butts. Sections of the Mississippian series near Huntsville were examined under cooperative agreement by Stuart Weller to gain a better understand-

ing of the faunal and stratigraphic features of the Mississippian series in southeastern Missouri, southern Illinois, and western Kentucky.

Carboniferous fossils from the State were studied by G. H. Girty, and Tertiary fossils were examined and reported on, with correlations, by W. H. Dall and W. C. Mansfield. Tertiary corals were studied by T. W. Vaughan, and the fossil Foraminifera found in the drill cuttings at several localities were examined by Julia Gardner and J. A. Cushman. Tertiary Foraminifera from Alabama are described by Dr. Cushman in a report on American species of *Ortho-phragmina* and *Lepidocyclina*, now ready for distribution as Professional Paper 125-D.

The Upper Cretaceous flora of the State is described by E. W. Berry in Professional Paper 112, and a description of the fossil plants of the middle and upper Eocene formations, by the same author, is now in preparation for publication as a professional paper.

The older Tertiary, Eocene, and Oligocene Bryozoa of Alabama are described by F. Canu and R. S. Bassler in a monographic report prepared under the auspices of the Survey but issued as Bulletin 106 of the United States National Museum.

Some of the more valuable deposits of white clay in Alabama are described by Prof. Heinrich Ries in a report on high-grade clays of the eastern United States, now in preparation for publication as Bulletin 708.

The stratigraphy and structure of southeastern Alabama were examined by O. B. Hopkins to determine whether they are favorable to the occurrence of oil and gas. The conclusions, which are essentially negative, were contributed to the press.

A brief statement on the manganese deposits of the northern part of the State is incorporated in a report on the manganese deposits of the Southern States, transmitted by G. W. Stose for publication by the Tennessee Geological Survey.

ARIZONA.

A folio covering the Ray quadrangle, which includes the Ray, Troy, and other important mining districts in Arizona, was completed and submitted by F. L. Ransome, chief of the section of metaliferous deposits. A report on the copper deposits of the Ray and Miami districts, by Mr. Ransome, has been published as Professional Paper 115. Mr. Ransome has made substantial progress on a general report on the geology and ore deposits of Arizona.

A short report on some of the geologic features of the lower Gila region, by C. P. Ross, will be issued as a chapter of "Shorter contributions to general geology." A report on deposits of manganese ore

in Arizona, by E. L. Jones, jr., and F. L. Ransome, has been published as Bulletin 710-D.

Older Paleozoic fossils from several localities in the State were examined by Edwin Kirk, and Carboniferous fossils collected by Kirk Bryan were reported on by G. H. Girty. Shells from the Quaternary deposits were studied by W. H. Dall.

The stratigraphy of the Carboniferous rocks in the northwest corner of the State was examined by J. B. Reeside, jr., and Harvey Bassler in connection with a study of the geology of the Virgin City oil field.

Deposits of asbestos near the Roosevelt dam and near Young, Gila County, were examined by J. S. Diller and will be described in a report on the asbestos resources of the United States.

ARKANSAS.

The geology and the results of recent drilling for oil around Eldorado and Stephens, in the southeastern part of Arkansas, were briefly examined by K. C. Heald, whose chief conclusions were issued in press-bulletin form.

A part of the Batesville district was examined by H. D. Miser, who submitted a preliminary and a detailed report on the deposits of manganese ore of the district. The preliminary report is to be published as Bulletin 715-G. The detailed report is now in preparation for publication as a complete bulletin. A paper entitled "Hausmannite in the Batesville district, Ark.," by Mr. Miser, was published in the *Journal of the Washington Academy of Sciences*. Mr. Miser has in preparation a report on graywacke in the DeQueen quadrangle, Arkansas and Oklahoma.

In response to a request from the Commission of Mines, Manufactures, and Agriculture of Arkansas, a short general description of the geology and topographic features of the State was prepared by Mr. Miser for publication in a State bulletin entitled "Outline of the geology, mineral resources, and soils of Arkansas."

Fossil plants from the middle and upper Eocene formations of the State are described by E. W. Berry in a report on the Eocene floras of southeastern North America, to be published as a professional paper. Eocene Bryozoa are described by F. Canu and R. S. Bassler in a monographic report prepared for the Survey and now in process of publication as Bulletin 106 of the United States National Museum. Eocene invertebrates from the State were examined by W. H. Dall, and the study of the fauna of the Morrow formation was continued by G. H. Girty. Silurian fossils were collected at several places in the State by R. D. Mesler.

Sunken and swamp lands in the eastern part of Arkansas were examined by E. W. Shaw for the Department of Justice.

A reprint of Bulletin 691-J, entitled "Asphalt deposits and oil conditions in southwestern Arkansas," by H. D. Miser and A. H. Purdue, has been issued.

A summary of the manganese deposits in Arkansas is given in a paper on the manganese deposits of the Southern States, by G. W. Stose, to be published by the Tennessee Geological Survey.

CALIFORNIA.

Studies of the geology and oil resources of the Los Angeles-Ventura area, California, were continued by W. S. W. Kew, who examined in detail the geology of the Montebello and Rapetto Hills oil fields. Detailed mapping was carried on by Mr. Kew in parts of the Fernando quadrangle and in the Pasadena quadrangle. The foothills east of Los Angeles River and south of the San Gabriel Mountains and San Gabriel Valley in the Pasadena quadrangle were critically examined. A report on the oil resources of the Los Angeles-Ventura region was completed and submitted by Mr. Kew. Areas in Imperial and San Diego counties in which indications of oil were reported to occur were visited by Mr. Kew, who promptly communicated to the press his conclusions as to the possibilities of finding oil there.

Under the general title "The Sunset-Midway oil field, California," two papers entitled "Geology and oil resources" and "Geochemical relations of the oil, gas, and water," by R. W. Pack and G. S. Rogers, respectively, have been issued as Professional Papers 116 and 117.

A paper on the geology and possible oil regions of northwestern Kern County, by W. A. English, is now in press as Bulletin 721. The demand for information respecting the geology of possible oil regions in the State has been so great that a reprint of Bulletin 691-H, on the Salinas Valley-Parkfield area, has been published.

Magnesite deposits at Hewett were examined by R. W. Stone, who is preparing a general report on the magnesite deposits of the United States.

Glacial and physiographic studies in the Yosemite region, including a study of the origin and history of the Yosemite Valley, were continued by F. E. Matthes, who early in July delivered three lectures on the history of the Yosemite Valley in the LeConte Memorial lecture course. These lectures are to be published by the National Park Service. A general report on the valley, designed for publication as a popular bulletin, has been prepared by Mr. Matthes in collaboration with F. C. Calkins, who contributed a description of the bedrock geology. Under the name "Coxcomb Crest," Mr. Matthes describes, in a paper published unofficially, a newly differentiated topographic form in the Yosemite region.

Reports on chromium and manganese ores in parts of California, by Prof. G. D. Louderback, of the University of California, are in preparation for publication. A report on deposits of manganese in southeastern California, by E. L. Jones, jr., has been published as Bulletin 710-E, and a paper on chromite in the Klamath Mountains has been prepared by J. S. Diller and transmitted for publication.

Reported nitrate deposits near West Well, in San Bernardino County, were examined by L. F. Noble, who, on his return from work in the Hawaiian Islands, resumed the preparation of his report on the nitrate deposits of California. A report on nitrate deposits in the Amargosa region, by L. F. Noble and G. R. Mansfield, has been transmitted for publication.

Tertiary and Quaternary fossils from California were examined and reported on by W. H. Dall, who is engaged in a comprehensive study of the invertebrate faunas of the Tertiary formations of the Pacific coast.

COLORADO.

The study of the origin, composition, and history of the igneous and metamorphic rocks of the San Juan region, in Colorado and New Mexico, was continued by Whitman Cross and E. S. Larsen, jr., assisted by C. S. Ross, who resumed field investigations in May. Progress has been made in the general monographic description of the region. The study of the Mesozoic and later formations and of the physiographic history of the region is being continued by Prof. W. W. Atwood, who, with R. F. Webb and P. E. James, geologic aids, resumed field work in June.

The Twentymile Park district of the Yampa coal field, Colorado, was examined for the classification and valuation of the lands by M. R. Campbell, who has nearly completed an economic report on the area. Mr. Campbell also visited several points on the Denver & Rio Grande Route in order to describe them in his guide to the railroad from Denver to Salt Lake, which was submitted by him for publication as a bulletin.

A short report on some deposits of manganese ore in Colorado, by E. L. Jones, jr., has been published as Bulletin 715-D.

Several points in the oil-shale region of the Uinta Basin were visited by Harvey Bassler, who made some progress in the study of the origin of the shales.

A strip along the southern border of the State, embracing those parts of the Trinidad coal field that border the Raton and Brilliant quadrangles, is described by W. T. Lee in the geologic folio covering those quadrangles, which has been submitted in revised form for publication. A report on the geology and ores of Creede, Colo., by

W. H. Emmons and E. S. Larsen, jr., is now in preparation for publication as Bulletin 718.

A monograph on the flora of the Denver formation is in preparation by F. H. Knowlton. "A dicotyledonous flora in the type section of the Morrison formation" is the title of an unofficial publication by Mr. Knowlton. The Cretaceous formations of the South Platte Valley east of Greeley and in the foothill region from Fort Collins north to the Wyoming line were studied in May and June by T. W. Stanton, and the Animas formation, in the southwestern part of the State, was examined by J. B. Reeside, jr. Material on the geology of the Red Mesa quadrangle was compiled by A. J. Collier. A paper on the pre-Cambrian rocks of Gunnison River, by J. F. Hunter, jr., and one on the geology and fuel resources of the Axial and Monument Butte quadrangles, in Moffat County, by E. T. Hancock, have been transmitted for publication as bulletins.

CONNECTICUT.

Additional field work in the lime belt of western Massachusetts and Connecticut and parts of eastern New York was done by T. Nelson Dale, and a progress report on the work has been submitted for publication as a bulletin of the Survey.

The granites of Connecticut are described by Mr. Dale in a manuscript on the commercial granites of New England, transmitted for publication as a bulletin. The peats are reviewed with reference to their distribution, composition, amount, and adaptability for use as fuels or fertilizers by E. K. Soper and C. C. Osbon in a manuscript on the occurrence and uses of peat in the United States, also transmitted for publication.

DELAWARE.

Parts of Delaware were visited by W. T. Lee to gather material for the geographic handbook covering Maryland, Delaware, and the Virginias. The chapter relating to the Coastal Plain region was submitted by Mr. Lee in June. The terraces in the "fall line" zone were reviewed by M. R. Campbell and Laurence LaForge for the same handbook in a study of the physiographic history of the Susquehanna region around Havre de Grace.

A folio on the Elkton and Wilmington quadrangles, an area that lies partly in Maryland and Pennsylvania, is now in press as Folio 211.

FLORIDA.

In conformity with the request of the State Public Health Office at Jacksonville, Fla., an investigation was made and a report submitted by C. P. Ross on the water conditions in the vicinity of Miami, and at the request of the United States Public Health Service certain

of the Florida keys were examined by J. S. Brown to determine the quality and the amount of the water supply.

Structural studies of parts of the State were made by C. Wythe Cooke, and notes based upon field observations of the structure as it may affect the possible occurrence of oil and gas were compiled by O. B. Hopkins and communicated to the State geologist, who gave a summary of Mr. Hopkins's conclusions to the press.

Samples of a well boring at Chipley and fossils collected at other places have been studied by J. A. Cushman, C. Wythe Cooke, Julia A. Gardner, and W. C. Mansfield. The lower Miocene Foraminifera and the species of *Operculina* and *Heterostegina* of the State are described in two papers by J. A. Cushman, submitted for publication as Professional Papers 128-B and 128-E. A paper by Dr. Cushman on American species of *Orthophragmina* and *Lepidocyclina* (Professional Paper 125-D) contains descriptions of species from Florida. A paper entitled "Some relationships of the Foraminifera of the Bryam calcareous marl," by Dr. Cushman, was published in the Journal of the Washington Academy of Science, and a description of the fossil Mollusca of the Alum Bluff formation, by Julia A. Gardner, is being prepared for publication. The fossil Bryozoa of the State are described in two monographic reports by F. Canu and R. S. Bassler, one on the lower Tertiary and one on the upper Tertiary Bryozoa of North America, both prepared under the auspices of the Survey but to be published as bulletins of the United States National Museum. Miocene fossils from several points in the State were examined by W. H. Dall.

The high-grade clays of Florida are described by Heinrich Ries, W. S. Bayley, and others in Bulletin 708, entitled "High-grade clays of the eastern United States," now nearly ready for publication.

GEORGIA.

Foraminifera belonging to the fossil genera *Operculina* and *Heterostegina* are described by J. A. Cushman in Professional Paper 128-E, which is now in press, and the genera *Orthophragmina* and *Lepidocyclina* are described in Professional Paper 125-D, already published. The Eocene and lower Oligocene Bryozoa of Georgia are described by F. Canu and R. S. Bassler in a report entitled "North American early Tertiary Bryozoa," being published as Bulletin 106 of the United States National Museum. Fossil Mollusca of the Alum Bluff formation are described by Julia A. Gardner in a manuscript now being prepared for publication. Material from a well near Fitzgerald was paleontologically examined by W. C. Mansfield.

The geologic structure of a part of the Coastal Plain region of Georgia was briefly studied by C. Wythe Cooke. Data showing the geologic structure of a part of southern Georgia so far as it may

affect the occurrence of oil and gas were compiled by Oliver B. Hopkins and transmitted to the State geologist. Samples of well borings, including fossils, from Waycross, Ga., were examined and reported on by J. A. Cushman for identification and correlation of the formations.

A valuable contribution to the botanic history of the State, by E. W. Berry, was published as Professional Paper 112, entitled "Upper Cretaceous floras of the eastern Gulf region in Tennessee, Mississippi, Alabama, and Georgia."

The manganese deposits of the Cartersville district are briefly described in a paper by G. W. Stose, to be published in a technical journal.

IDAHO.

In cooperation with the Idaho State Bureau of Mines and Geology, the study of the geology and ore deposits of the Seven Devils district, along Snake River, was begun in the season of 1919 by F. B. Laney for the United States Geological Survey and D. C. Livingston for the State, Mr. Laney being in charge particularly of the geologic examination of the ore deposits. Mr. Laney collaborated with Mr. Livingston in the preparation of a preliminary report on the district, for publication by the State, and in April, 1920, began to extend his investigations into adjacent territory in Oregon. The final results of the cooperative studies will be published as a professional paper of the United States Geological Survey.

A report on the geology and ore deposits of Idaho, which was in preparation by J. B. Umpleby and E. L. Jones, jr., was left unfinished by these geologists at the time of their resignation. Some of the results of their field examinations, however, have been published in reports on individual districts and counties, and include also a manuscript report by J. B. Umpleby, entitled "The ore deposits of Shoshone County, Idaho, with particular reference to the Coeur d'Alene district," which will be published as a bulletin. The notebooks of Messrs. Umpleby and Jones, covering their field work in central Idaho, have been loaned to the Idaho bureau for use by Prof. Livingston in preparing for State publication a report on the mining districts of that part of the State. A report on a reconnaissance of the Pine Creek district, by E. L. Jones, jr., has been issued as Bulletin 710-A.

Economic data on four townships in southeastern Idaho that had been withdrawn as of possible value for deposits of phosphate were prepared by G. R. Mansfield for use in the classification of the land. A report on the economic geology of the Fort Hall Reservation, by Mr. Mansfield, is in press as Bulletin 713.

A report on the geology, geography, and mineral resources of a part of southeastern Idaho, embracing the Wayan, Cranes Nest, Montpelier, Randolph, Crow Creek, Lanes Creek, Slug Creek, and Portneuf quadrangles, has been brought to an advanced stage by Mr. Mansfield. Papers on the Triassic and Jurassic formations of southeastern Idaho, the igneous geology of southeastern Idaho, the Wasatch and Salt Lake formations of southeastern Idaho, and types of Rocky Mountain structure in southeastern Idaho have been transmitted by Mr. Mansfield for unofficial publication. Carboniferous fossils collected by Mr. Mansfield and others were studied by G. H. Girty.

A report on the Yellow Pine cinnabar district, Idaho, by E. S. Larsen, jr., and D. C. Livingston, has been published as Bulletin 715-E, and a short paper on coal in eastern Idaho, by Mr. Mansfield, is in press as Bulletin 716-F.

A report on oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah, by D. Dale Condit, was published as Bulletin 711-B.

ILLINOIS.

Certain phases of the loess and associated clays near Belleville, Ill., were the subject of a conference held in July between Frank Leverett and E. W. Shaw, of the United States Geological Survey, and M. N. Leighton and Stuart Weller, of the Illinois Geological Survey. The facts to be set forth in a joint cooperative report on Hardin County, to be published by the State, were reviewed in the field by Charles Butts and Mr. Weller, the authors of the report.

The New Athens and Okawville quadrangles are mapped and described in detail in Folio 213 of the Geologic Atlas, the maps for which are now in the proof stage.

The regions of cement production in Illinois were visited by E. F. Burchard.

INDIANA.

A report by G. F. Loughlin, describing the characteristics of the Indiana limestone and differentiating the quarry output by grades, is now in progress, the work being done in cooperation with the Supervising Architect of the Treasury, the Bureau of Standards, and the Indiana Quarrymen's Association.

Field studies of the stratigraphy and paleontology of the Mississippian series at several places in Indiana, including Spergen Hill, for purposes of correlation, were made by E. O. Ulrich and Charles Butts.

The peat deposits of Indiana are briefly described with reference to their use as fuels or fertilizers in a report by E. K. Soper and C. C. Osbon entitled "Occurrence and uses of peat in the United States," transmitted for publication as a bulletin.

IOWA.

A reconnaissance study of the glacial deposits of western Iowa was made in the season of 1919 by W. C. Alden with the special object of obtaining criteria for differentiating the older drifts in that State and in eastern Nebraska. A preliminary report on the Quaternary deposits of the region has since been prepared by Mr. Alden.

The Upper Cretaceous sections at a number of points in the western part of the State were examined in the spring of 1920 by T. W. Stanton in cooperation with the assistant State geologist, J. H. Lees.

The gypsum deposits of the State are described by R. W. Stone in Bulletin 697, entitled "Gypsum deposits in the United States."

KANSAS.

A report describing the stratigraphy, geologic structure, and oil resources of the Eldorado district, Kansas, with special reference to the conditions of occurrence of the oil and gas, has been prepared by A. E. Fath for publication by the State Geological Survey, in cooperation with which the investigations were made. Drill cuttings from the district were paleontologically examined by P. V. Roundy. The regional distribution, the trend, and the mode of occurrence of the anticlines and faults in the oil fields of eastern Kansas are described by Mr. Fath in Professional Paper 128-C, under the title "The origin of the faults, anticlines, and buried granite ridge, of the northern part of the Mid-Continent oil and gas field."

The fossil flora of the Cheyenne sandstone is being studied by E. W. Berry, and some Carboniferous fossils collected by C. S. Prosser in the eastern part of the State were studied and arranged by G. H. Girty.

A folio covering the Syracuse and Lakin quadrangles is in press and nearly ready for publication as Folio 212 of the Geological Atlas.

The gypsum deposits of the State are described by R. W. Stone in Bulletin 697, "Gypsum deposits of the United States."

The distribution, mode of occurrence, and amount of helium available in the natural gas of Kansas are discussed by G. S. Rogers in a report on "Helium-bearing natural gas," now in press as Professional Paper 121. This paper contains also data on structure and stratigraphy that will make it valuable to the oil operators of the State.

KENTUCKY.

The study of the stratigraphy and history of the Mississippian formations in central Kentucky was undertaken by Charles Butts. This work includes the mapping of the principal divisions over an

area of more than 400 square miles and is a part of the mapping of the entire Mississippian series about the Cincinnati axis, undertaken in cooperation with the State Geological Survey. The Mississippian formations were examined also in the vicinity of Lebanon Junction and at Colesburg and farther east through Bullitt, Hardin, Marion, Taylor, Boyle, and Pulaski counties. A report on the structure and oil resources of Barren County was prepared by Mr. Butts and has been issued as a bulletin of the State Survey.

Special studies at the Warsaw horizon of the Mississippian series were made by Charles Butts, and data were collected for more exact correlation with beds supposed to be contemporaneous in Indiana, Tennessee, and Alabama.

The coal at a number of mines near Tug River, in eastern Kentucky, was sampled by J. D. Sears to determine its quality and to procure carbonization data defining the possible southeastern boundary of the Appalachian oil field.

The white clays of the western part of the State are described by Prof. Heinrich Ries in a report entitled "High-grade clays of the eastern United States," now in preparation for publication as Bulletin 708.

LOUISIANA.

In response to a request from the city of Shreveport, La., an investigation of the natural-gas reserves possibly available for the use of that city was made by E. W. Shaw, whose informal and brief report transmitted to the Commissioner of Public Utilities of Shreveport was printed by the local papers. The gas resources of the State were further considered in connection with the cooperative examination of the gas supplies tributary to the city of Dallas, Tex.

In cooperation with several of the oil companies, drill cuttings and fossils obtained from a number of wells in Louisiana were examined for the purpose of identifying and correlating so far as possible the formations penetrated by the drill. In these examinations J. A. Cushman identified the Foraminifera, M. I. Goldman studied the chemical and mechanical constitution of the rock, and W. H. Dall and W. C. Mansfield attempted the correlation. Foraminifera of the genera *Orthophragmina* and *Lepidocyclina* are described by Dr. Cushman in a report published as Professional Paper 125-D. The Eocene Bryozoa of the State are described by F. Canu and R. S. Bassler in a report now being published as Bulletin 106 of the United States National Museum. Cretaceous and Tertiary invertebrates from the State were examined by T. W. Stanton and W. H. Dall, respectively.

MAINE.

The geographic features of Maine are described by Arthur Keith in the handbook of New England geography, the manuscript for which is nearly completed. The text will be accompanied by a new map in which the topography is shown in 100-meter contours.

The peat deposits of Maine are described by E. K. Soper and C. C. Osbon, with special reference to their utilization as fuels or in the manufacture of fertilizers, in a bulletin entitled "Occurrence and uses of peat in the United States," transmitted for publication, and the granites of the State are discussed by T. Nelson Dale in a bulletin on the commercial granites of New England, now in hand.

MARYLAND.

The metamorphic and Paleozoic region of Baltimore County, Md., including parts of the Ellicott, Parkton, Westminster, Baltimore, Gunpowder, Laurel, and Relay quadrangles, was studied by E. F. Bliss in cooperation with A. I. Jonas, of the State Geological Survey. Reconnaissance studies of the crystalline schists of Carroll, Howard, and Frederick counties were made in order to ascertain the general relations of the rocks in these areas to those in Baltimore County. Conferences for the field comparison of the Paleozoic beds of this region with those in southern Pennsylvania were held by G. W. Stose, E. F. Bliss, and A. I. Jonas. A report on the geology of the crystalline schists of Baltimore County is now in preparation by Mrs. E. B. Knopf (formerly Miss Bliss) and Miss Jonas.

A manuscript by Mrs. Knopf on the chrome ores of southeastern Pennsylvania and Maryland has been submitted for publication, and a folio by Dr. F. Bascom describing and mapping in detail the geology of the Elkton and Wilmington quadrangles (Folio 211), is now in press.

The problem of providing an adequate supply of artesian water for the naval proving ground and powder plant at Indian Head was investigated by C. W. Cooke.

Geographic data relating in particular to the interstream areas of the Coastal Plain region were collected by W. T. Lee for inclusion in the chapter of the geographic handbook on the Coastal Plain region of Maryland, Delaware, and Virginia.

The Tertiary Bryozoa of the State are described by F. Canu and R. S. Bassler in a report in course of publication by the United States National Museum. Extensive collections of Tertiary and Pleistocene fossils were made by W. C. Mansfield at Cornfield Harbor, Langleys Bluff, and Chancellors Point, and other collections from beds of the same age at several points were studied by W. H. Dall.

The type collection of the flora of the Potomac formation was classified and relabeled by F. H. Knowlton and T. E. Williard.

The white clays of the State are treated by Heinrich Ries in a general report by Ries, Bayley, and others entitled "High-grade clays of the eastern United States," to be published as Bulletin 708.

MASSACHUSETTS.

The dolomitic and calcitic limestone belts in the Stockbridge limestone areas of western Massachusetts were mapped in detail by T. Nelson Dale for description in a bulletin on the lime-producing belt of western Massachusetts and Connecticut now in preparation. A paper on the evidence of a local unconformity between the Berkshire schist and Stockbridge limestone, in the vicinity of Adams, was prepared by Mr. Dale for unofficial publication. The granites of the State are described by Mr. Dale in his forthcoming bulletin on the commercial granites of New England.

A report on the geology of Cape Cod and the islands off the coast of Massachusetts by J. B. Woodworth has been submitted for publication. Quaternary shells from the region were examined by W. H. Dall.

Local examinations were made at several points in the metamorphic area of the State by G. F. Loughlin.

The geographic features of the State are described by Arthur Keith in the manuscript, now nearly completed, entitled "A handbook of the geography of New England." The Connecticut Valley is treated by Prof. W. M. Davis, of Harvard University.

The peat deposits of the State are briefly described, with special reference to their utilization as fuels or in the manufacture of fertilizers, in a paper by E. K. Soper and C. C. Osbon, entitled "Occurrence and uses of peat in the United States," which will be published as a bulletin of the Survey.

A paper on the igneous rocks of Essex County, Mass., by Prof. C. H. Clapp, is now in press as Bulletin 704.

MICHIGAN.

Reconnaissance mapping of the glacial features and shore lines of the northern peninsula of Michigan, in Menominee County and parts of Delta and Chippewa counties, including Drummond Island, and detailed mapping of the surface geology in those parts of the southern peninsula that embrace the Perrinton, Elsie, Chesaning, Burt, St. Charles, Saginaw, and Bay City quadrangles have been carried on by Frank Leverett. This work, which included examinations of swamp and cut-over lands and agricultural conditions, was done in cooperation with the Michigan Geological Survey. At the request

of the Michigan Highway Department, Prof. Leverett devoted a part of the year to the examination of glacial material suitable for road building. Papers on waste lands and on the glacial geology of Michigan were presented by Prof. Leverett before the Michigan Academy of Sciences.

The gypsum resources of the State are described by R. W. Stone in a report entitled "Gypsum deposits of the United States," now in press as Bulletin 697, and the peats are briefly described with reference to their value for use as fuels or in fertilizers by E. K. Soper and C. C. Osbon in a general report entitled "Occurrence and uses of peat in the United States," to be published as a bulletin.

MINNESOTA.

A report on the moraines and shore lines of the part of the Lake Superior basin that lies within the United States has been prepared by Prof. Frank Leverett.

The Herman, Barrett, Chokio, and Morris quadrangles, which include parts of Grant and Stevens counties, Minn., are mapped and described in detail by F. W. Sardeson in Folio 210 of the Geologic Atlas.

Further investigations of the Cuyuna range and work in the preparation of the final report thereon have been suspended on account of the resignation of E. C. Harder, geologist in charge of the project. A preliminary report on the range has been published by the State, in cooperation with which the studies were carried on. A report by Mr. Harder, entitled "Iron-depositing bacteria and their geologic relations," published as Professional Paper 113, is in large part based on these investigations, which, like the studies of the peat and glacial formations, were undertaken in cooperation with the State Geological Survey.

A report on the clays and shales of Minnesota by F. F. Grout, with contributions by E. K. Soper, has been published as Bulletin 678.

MISSISSIPPI.

The ground-water resources of Mississippi were the subject of special field examinations during the season of 1919 by L. W. Stephenson. The manuscript of the geologic part of Mr. Stephenson's report, which is cooperative, is practically complete. The preparation of the geologic map to accompany this report required studies of the stratigraphy by C. W. Cooke and of the paleontology by J. A. Cushman. A report by Dr. Cushman on the Foraminifera of the Byram marl has been submitted for publication. Fossil Mollusca from the same formation have been studied by Julia Gardner, and the stratigraphy has been studied by C. W. Cooke, both of whom pre-

pared contributions on the paleontology of the Byram marl. The work is done in cooperation with the State Geological Survey.

The American species of Foraminifera belonging to the genera *Orthophragmina* and *Lepidocyclina* are described by J. A. Cushman in Professional Paper 125-D, and the Upper Cretaceous flora of the State is described by E. W. Berry in Professional Paper 112. A report by Mr. Berry on the fossil plants of the middle and upper Eocene formations is awaiting publication.

Eocene and Oligocene Bryozoa from several localities are described by F. Canu and R. S. Bassler in Bulletin 106 of the United States National Museum.

The white clays at several points in Mississippi are discussed by Prof. Heinrich Ries in a general report on "High-grade clays of the eastern United States," to be published as Bulletin 708.

MISSOURI.

The older Paleozoic formations at a number of points in Missouri were examined by E. O. Ulrich, with the assistance of R. D. Mesler, who made collections of fossils for paleontologic investigation and interstate correlations. A small Pennsylvanian fauna from the State was described by G. H. Girty.

MONTANA.

A reconnaissance examination of the Poplar dome, in Montana, was made by W. T. Thom, jr., and W. P. Woodring in connection with the geologic mapping, with special reference to the classification, of the lignite-bearing lands in central Dawson County.

The results of examinations of the stratigraphy and structure in the Crow Indian Reservation, made in preceding years by C. H. Wegemann, R. W. Howell, and C. K. Wentworth with particular reference to the possible occurrence of oil, gas, and coal, have been considered by Messrs. Wegemann and Wentworth, and the conclusions reached have been embodied in a manuscript now in preparation for publication.

A paper entitled "Oil and gas geology of the Birch Creek-Sun River area, northwestern Montana," by Eugene Stebinger, published as Bulletin 691-E, has been reprinted to meet the demand for descriptions of prospective oil lands in the State.

The practicability of obtaining oil by the distillation of carbonaceous beds in the Permian and Tertiary series is discussed by D. Dale Condit in a paper entitled "Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah," published as Bulletin 711-B.

A report on the Scobey lignite field in Montana was prepared by A. J. Collier for publication as a bulletin.

A brief report on phosphate rock near Maxville, Mont., was prepared and transmitted by J. T. Pardee for publication as Bulletin 715-J.

The manganese ore deposits of Montana, with those of Utah, Washington, and Oregon, are treated in a report by Mr. Pardee, now ready to be submitted for publication. A paper on iron ore near Stanford, Mont., by L. G. Westgate, has been published as Bulletin 715-F.

A report by Prof. Westgate on chromite deposits in Stillwater and Sweetgrass counties, Mont., is ready for submission.

The fauna of the Eagle formation has been under study by J. B. Reeside, jr., and Cretaceous fossils from several localities have been studied by T. W. Stanton. Carboniferous invertebrates were identified by G. H. Girty.

A report entitled "Geology and oil and gas prospects of the Huntley field, Mont.," by E. T. Hancock, has been published as Bulletin 711-G.

A report entitled "Gradations from continental to marine conditions of deposition in central Montana during the Eagle and Judith River epochs," by C. F. Bowen, was published as Professional Paper 125-B.

Data for use in the preparation of a geologic map of Montana were compiled by J. D. Sears and will be contributed to the State Bureau of Mines and Metallurgy.

The reconnaissance examination of the glacial deposits of the foothills and plains regions, which was discontinued during the war, was resumed in May by W. C. Alden, who has in preparation a report on the Quaternary geology of the Glacier National Park and northern Montana.

NEBRASKA.

Field examinations of the Pleistocene deposits in northeastern Nebraska were made by W. C. Alden with the cooperation of the State geologist. The results will be embodied in a report on the Pleistocene of eastern Nebraska and western Iowa, now in preparation by Mr. Alden.

The type sections of the Dakota sandstone and Niobrara limestone and other associated Cretaceous formations in eastern Nebraska were studied by T. W. Stanton in May and June.

A paper on the potash resources of Nebraska, by W. B. Hicks, in press as Bulletin 715-I, describes the potash-bearing lake basins of the State and discusses the value of the deposits.

NEVADA.

The Manhattan district, in Nevada, which is the subject of an uncompleted report by H. G. Ferguson, was revisited by him in June to determine the results of recent mining development and to supplement the previous observations of the intricate and interesting structure of the region.

The examinations of the Divide district were completed in August by Adolph Knopf, who visited also the Rochester and Round Mountain districts. A report on the Divide district has been submitted by Mr. Knopf for publication as Bulletin 715-K.

Additional field examinations were made by F. C. Schrader in the Carson Sink quadrangle in order to obtain the latest field data for his report on the quadrangle.

The deposits of oil shale at Elko and several other points in northern Nevada are described and mapped by J. P. Buwalda in a report now ready to be submitted for publication.

A short report by J. T. Pardee and E. L. Jones, jr., on deposits of manganese ore in Nevada was published as Bulletin 710-F.

NEW HAMPSHIRE.

The handbook on the geography of New England, now practically completed by Arthur Keith, will describe the geographic features of New Hampshire and will give special consideration to their origin.

The granites of New Hampshire are described by T. Nelson Dale in a bulletin on the commercial granites of New England, now in hand, and the peat deposits are reviewed by E. K. Soper and C. C. Osbon, with special reference to their use as fuels or in fertilizers, in a general bulletin on the occurrence of peat in the United States, also in hand.

NEW JERSEY.

A discussion of the general geology and origin of the ore deposits at Franklin Furnace and Sterling Hill, N. J., has been prepared by A. C. Spencer for inclusion in a report by Dr. Charles Palache on the minerals of Franklin Furnace.

The peat resources of the State are briefly reviewed, with special reference to their value as fuels or in the manufacture of fertilizers, by E. K. Soper and C. C. Osbon, in a bulletin on the occurrence and uses of peat in the United States, transmitted for publication.

NEW MEXICO.

A report on the ore deposits of the Mogollon district, N. Mex., is in preparation by H. G. Ferguson, who revisited the district in June to obtain further details and to note the results of recent develop-

mental exploration. The report will be published as Bulletin 715-L. A report by Sidney Paige on the copper deposits of the Tyrone district has been submitted for publication as a professional paper.

Progress in the preparation of a report on the ore deposits of the Santa Rita district was made by A. C. Spencer.

A brief report on the molybdenum mines near Questa was prepared by C. S. Ross, and a report on deposits of manganese ore in New Mexico, by E. L. Jones, jr., has been published as Bulletin 710-B.

Coal lands in the region around Gallup were examined during the season of 1919 by J. D. Sears, with the assistance of E. S. Bleeker, for the purpose of determining the number and extent of the coal beds in the region and to obtain data for the classification of the lands. A brief examination was made by Mr. Sears of the local stratigraphy and of the results of recent tests for oil in the Seven Lakes district, in eastern McKinley County. Reconnaissance inspection was also made of oil indications near Battle Mesa and Zuni.

A report by N. H. Darton on the geologic structure of parts of New Mexico, transmitted for publication, describes the major structural features of the State and the regional stratigraphy for the use of the oil geologist.

A report on the geology and oil prospects of Alamosa Creek valley, in Socorro County, by D. E. Winchester, has been published as Bulletin 716-A.

A report on coal in San Juan County, by C. M. Bauer and J. B. Reeside, jr., is in course of publication as Bulletin 716-G.

The stratigraphy, the areal distribution, and the history of the deposition of the salt-bearing "Red Beds" of New Mexico are described in a report by N. H. Darton on the Permian salt deposits of the southwestern United States, to be issued as Bulletin 715-M. The field investigations were made in connection with the search for potash. Additional field examinations, resulting in greater refinement in mapping, were made for the revision of the geologic map of New Mexico, prepared by Mr. Darton to accompany this report.

The gypsum resources of the State are described by R. W. Stone in Bulletin 697, which is a general description of the gypsum deposits of the United States, now in press. A magnesite deposit and the Great Eagle fluorspar mine, 30 miles north of Lordsburg, were examined by Mr. Stone.

The text of a folio describing in detail the geology of the Brilliant, Raton, and Koehler quadrangles was revised by W. T. Lee after he had made further examinations of parts of the area. The maps for the folio are being engraved. Mr. Lee has submitted also a special report on the coal resources of the Raton coal field for publication as a bulletin. An article entitled "Notes on the Manzano group,

New Mexico," has been transmitted by Mr. Lee for outside publication.

Rapid reconnaissance examinations of parts of the Taos, Abiquiu, Gallina, Santa Clara, and Jemez quadrangles were made by E. S. Larsen, jr., and C. S. Ross, and local studies were carried on by Whitman Cross in the Jemez Mountains, the Pajarito Plateau, and the Rio Grande canyon to ascertain the source and the time relations of certain basalts and rhyolites of San Luis Valley, Colo.

The Cretaceous and early Tertiary formations flanking the San Juan Mountains were examined in the spring of 1920 by J. B. Reeside, jr., with the assistance of C. E. Dobbin, for the purpose of obtaining data for the more exact correlation of the formations and ascertaining their relations to the igneous history of the San Juan region.

Fossils from the early Paleozoic, the Carboniferous, and the Cretaceous formations of the State were examined by Edwin Kirk, G. H. Girty, and T. W. Stanton, respectively, and Tertiary and Quaternary Mollusca were examined by W. H. Dall.

A description by C. W. Gilmore of the reptilian faunas of the Torrejon, Puerco, and underlying Upper Cretaceous formations of San Juan County has been published as Professional Paper 119.

NEW YORK.

A report on the structure of the Taconic Range, in New York, is in an advanced stage of preparation by Arthur Keith.

The Trenton and Black River sections in the central part of the State were examined by E. O. Ulrich in cooperation with Dr. R. Ruedemann, of the State Geological Survey.

The dolomitic and calcitic limestone belts in the towns of Dover and Amenia, Dutchess County, were mapped in detail by T. Nelson Dale and are described in a manuscript report by him on the lime-producing belts of western Massachusetts and Connecticut and eastern New York.

The peat resources of the State are summarized in a general report by E. K. Soper and C. C. Osbon on the occurrence and uses of peat in the United States, to be published as a bulletin.

NORTH CAROLINA.

The investigation of the iron-ore deposits of North Carolina, made in cooperation with the North Carolina Geological and Economic Survey with the object of preparing a report for publication by that Survey, was continued by W. S. Bayley in June. A report by J. Volney Lewis on deposits of chrome ore in North Carolina is ready for transmission for publication.

The results of the study of the limestones of the State are embodied in a report by G. F. Loughlin, transmitted for publication by the State geologist, in cooperation with whom the work was done.

The mica resources of the State are described in a report on the mica deposits of the United States, by D. B. Sterrett, submitted for publication as a bulletin.

Bryozoa of early Tertiary and late Tertiary age collected at many places in the State are described by F. Canu and R. S. Bassler in reports prepared under the auspices of the Survey but now being published as bulletins of the United States National Museum.

The peat resources of the State are briefly described in a general report by E. K. Soper and C. C. Osbon on the occurrence and uses of peat in the United States, transmitted for publication as a bulletin of the Survey, and in a special paper entitled "Peat in the Dismal Swamp, Virginia and North Carolina," by Mr. Osbon, issued as Bulletin 711-C.

The manganese deposits of the State are briefly described in a paper by G. W. Stose on the manganese deposits of the Southern States in a technical journal.

NORTH DAKOTA.

Coal lands in an area southwest of Missouri River between Mandan and the Fort Berthold Indian Reservation were examined for purposes of classification by A. J. Collier, who has in preparation an economic bulletin on the area. A report on the coals of the southwestern part of the Fort Berthold Indian Reservation, by C. M. Bauer, is under revision for publication. A report describing the New Salem lignite field, by E. T. Hancock, has been submitted for publication in "Contributions to economic geology."

A description of the fauna of the Cannonball marine member of the Lance formation, by T. W. Stanton, has been published as Professional Paper 128-A. The corals of the formation are described by T. W. Vaughan in the same paper.

The geologic conditions in the vicinity of wells drilled or to be drilled near Williston were inspected by W. T. Thom, jr., and W. P. Woodring.

The report on the Nesson anticline, Williams County, by A. J. Collier, published last year as Bulletin 691-G, has been reprinted.

OHIO.

The glacial deposits in the Cleveland, Berea, and Euclid quadrangles, Ohio, which are covered by the Cleveland folio, were in June reviewed by Frank Leverett, who is completing the part of the folio text relating to the Pleistocene deposits.

The mineral resources other than oil and gas of the Woodsfield and Summerfield quadrangles, in eastern Ohio, are described by D. Dale Condit in a report transmitted for publication as a bulletin.

OKLAHOMA.

The geologic structure of parts of Caddo County, Okla., including the Cement oil field, was, at the request of the Office of Indian Affairs, examined by Frank Reeves, who has submitted a report, with maps, on the structure and oil and gas prospects of the region for publication in "Contributions to economic geology."

A report on the geology and oil resources of T. 28 N., Rs. 11 and 12 E., in the Osage Reservation, has been submitted by M. I. Goldman and H. M. Robinson for publication as Bulletin 686-Y, and manuscript and maps covering T. 29 N., Rs. 11 and 12 E., have been nearly completed by Mr. Goldman. Chapters S to V, inclusive, of Bulletin 686 have been published during the year. Chapters B to L, inclusive, have been reprinted to meet an urgent demand for information as to the structure of this region.

Additional data concerning developments on the Osage lands were obtained by K. C. Heald on the occasion of his attendance, by request of the superintendent of the agency, at a sale of Osage land leases at Pawhuska, May 18. Bulletin 691-C, on the geologic structure of the northwestern part of the Pawhuska quadrangle, by Mr. Heald, was reprinted to supply a large demand.

At the request of the Department of Justice the physiographic features and recent changes in Red River in the vicinity of Grandfield, Okla., and Burkburnett, Tex., were studied by E. W. Shaw, in order to assist in determining the ownership of the land, which includes a part of the Burkburnett oil field, the ownership being dependent on the mode of lateral migration of Red River in the area.

The Bristow quadrangle was revisited by A. E. Fath to procure data embodying results of tests made subsequent to the publication by this Survey of structure maps of the quadrangle. The data are to be used by Mr. Fath in completing his report on the geology and oil and gas resources of the quadrangle.

The character and origin of the oil-bearing folds and of the faults in northeastern Oklahoma are discussed in a paper by Mr. Fath on certain geologic features of the northern part of the Mid-Continent oil and gas field, published as Professional Paper 128-C.

A report on the mode of occurrence, distribution, and quantity of helium in the natural gas of parts of northern Oklahoma, by the late G. S. Rogers, is now in course of publication as Professional Paper 121.

The stratigraphy and structure of the region bordering Red River on the south and embracing Madill are described with reference to

its possible content of oil in a paper by O. B. Hopkins, Sidney Powers, and H. M. Robinson, transmitted for publication in "Contributions to economic geology."

Sections of the older Paleozoic beds near Overbrook were examined by R. D. Mesler, and Carboniferous fossils of the Morrow formation were studied for publication by G. H. Girty.

The salt deposits of the "Red Beds" region are discussed by N. H. Darton in a report to be issued as Bulletin 715-M, and the gypsum deposits in a general report by R. W. Stone on the gypsum deposits of the United States, in press as Bulletin 697.

OREGON.

At the request of the Director of the Oregon Bureau of Mines and Geology, the Tertiary lake basins of the State east of the Cascade Mountains were examined by J. P. Buwalda, with special reference to the structure and the possible oil and gas content of the basins, particular attention being given to the areas of wildcat testing. A report by Mr. Buwalda on the results of the work is nearly ready for transmission for publication by the State, in cooperation with which the examinations were made.

The mining geology of the part of the Seven Devils mining district that lies in Oregon has been under examination by F. B. Laney in connection with a general investigation of the geology and ore deposits of the district in cooperation with the Idaho Bureau of Mines and Geology. A preliminary report by Mr. Laney and D. C. Livingston, representing the State, has been submitted for publication by the State. A more extended report on the geology and ore deposits of the region may later be prepared by these geologists for publication by the Survey as a professional paper.

A report on chromite deposits of eastern Oregon, by L. G. Westgate, transmitted for publication in "Contributions to economic geology," gives the results of war-mineral examinations made for the Survey by Prof. Westgate. The chromite ores of the Klamath Mountain region have been reported on by J. S. Diller, and the manganese deposits of the State are described and mapped in a bulletin on the manganese ores in Montana, Utah, Oregon, and Washington, by J. T. Pardee, transmitted for publication.

Invertebrate fossils of Cretaceous age collected in Oregon were examined by T. W. Stanton.

PENNSYLVANIA.

Field examinations of the northern third of the McCall's Ferry and Quarryville quadrangles, in southeastern Pennsylvania, were made by E. F. Bliss and A. I. Jonas, in conference with G. W. Stose,

for the purpose of establishing correlations between the formations in this area and those mapped by Mr. Stose in the less altered region farther northwest. The folio covering these quadrangles is now in preparation. The limestone-bearing areas of the Norristown and Germantown quadrangles also were visited by the party, in conference with Dr. F. Bascom, who has been engaged in mapping the geology of these quadrangles. Additional field observations were made in the New Holland, Lancaster, York, and Middletown quadrangles to correlate the quartzites and limestone of the Lancaster area with those to the southwest.

Some progress was made by Dr. Bascom on the texts covering the Coatesville and West Chester quadrangles. An article on peneplains of the Piedmont province in Pennsylvania has been transmitted by Dr. Bascom for outside publication.

Data bearing upon the later physiographic history of the Delaware Valley, near the southern border of the State, were gathered by M. R. Campbell and Laurence LaForge.

Arrangements have been made for the completion, with the cooperation of the State Geological Survey, of the work in the New Kensington quadrangle, begun in 1918 by G. B. Richardson, who was transferred to the division of mineral resources to take charge of the statistical work on petroleum.

The chrome ores of the southeastern part of the State are described in a report by E. B. Knopf submitted for publication.

A report by B. L. Miller on the economic geology of the Allentown quadrangle is ready for publication as Bulletin 707.

Popular descriptions of the nature and origin of the salient geographic features of the Punxsutawney and Curwensville quadrangles were prepared by G. H. Ashley for publication on the backs of the topographic maps of those quadrangles.

Several valuable clay deposits of the State are described by Heinrich Ries in a report on the high-grade clays of the eastern United States, to be published as Bulletin 708.

A narrow strip along the southern border of the State is covered in the Elkton-Wilmington folio, now in course of publication as Folio 211.

RHODE ISLAND.

A report on the geology of the islands off the coast of Rhode Island has been submitted by J. B. Woodworth for publication as a bulletin.

The granites of the State are described in a report by T. Nelson Dale on the commercial granites of New England prepared for publication as a bulletin.

SOUTH CAROLINA.

The preparation of a report on the geology and ground waters of the Coastal Plain region of South Carolina was continued by C. W. Cooke prior to his absence for a part of the year on account of private research in Mexico.

Bryozoa of early and late Tertiary age from several localities in the State are described by F. Canu and R. S. Bassler in bulletins published by the United States National Museum.

The peat deposits of the State are reviewed, with reference to their utilization in fertilizers or as fuels, by E. K. Soper and C. C. Osborn in a bulletin on the occurrence and uses of peat in the United States.

The manganese deposits of the State are briefly referred to in a report on the "Manganese deposits of the Southern States," by G. W. Stose.

SOUTH DAKOTA.

Cretaceous sections along the eastern margin of the Black Hills from Hot Springs to Rapid City, S. Dak., and on the plains in the valleys of Cheyenne River and Sage Creek were studied by T. W. Stanton. The fossil faunas of the Cannonball marine member of the Lance formation are described by Mr. Stanton in Professional Paper 128-.

The Newell folio (No. 209) was completed and published. The Black Hills folio, covering the Deadwood, Rapid, Harney Peak, and Hermosa quadrangles, is now in process of engraving.

A report by E. T. Hancock on the New Salem lignite field, Morton County, has been transmitted for publication in "Contributions to economic geology."

TENNESSEE.

In November W. O. Hotchkiss and Adolph Knopf spent a few days in the Ducktown copper district, Tennessee, to test the possibility of locating by the dip needle ore bodies that do not appear at the surface.

The studies of the manganese ore deposits of the State made in connection with examinations of war minerals were completed, and a report on the manganese ore deposits of the Southern States was prepared and submitted by G. W. Stose for publication in the Engineering and Mining Journal. Manganese deposits at several points in east Tennessee were further examined by Messrs. Stose and F. C. Schrader, and a comprehensive report on the manganese deposits of east Tennessee has been submitted for publication as a bulletin.

The marble-quarrying area near Knoxville is being mapped, both topographically and geologically, in great detail by K. K. Kimball, the maps to be incorporated in the cooperative bulletins (1) on the Holston marbles of east Tennessee, to be printed by the State Geo-

logical Survey, and (2) on the marble deposits of the southern Appalachian region, the greater part of which was compiled by T. Nelson Dale for publication by the United States Geological Survey.

The principal deposits of clays in western Tennessee are described by Prof. H. Ries in a report on high-grade clays in the eastern United States, now in preparation for publication as Bulletin 708.

Parts of the Waynesboro quadrangle were visited in June by H. D. Miser, to note recent economic developments. Mr. Miser has in preparation a report on the mineral resources of this quadrangle, which he mapped under a cooperative arrangement. An informal report by Mr. Miser on the brown ores of the region embracing this quadrangle was prepared for the War Department.

At the request of the State geologist, the stratigraphy and structure of parts of Sumner County were examined in cooperation with the State Geological Survey by K. F. Mather, whose report on the structure and oil prospects of the area examined is now in press as Bulletin 24 of the State Survey.

Certain of the early Paleozoic formations in east Tennessee were studied in June by E. O. Ulrich, Charles Butts, and R. D. Mesler. Eocene fossils from the State were examined by W. H. Dall.

In May brief paleontologic investigations were made in the Briceville and Rockwood quadrangles by David White, to determine whether coal measures of so late age as the Allegheny of the northern Appalachian coal field occur in deep basins in these quadrangles.

Comprehensive reports on the fauna and flora of the Ripley formation in western Tennessee have been submitted by Bruce Wade and E. W. Berry, respectively, for publication as a professional paper of the United States Geological Survey. The researches on which these reports are based were made in cooperation with the State Survey. A report by Prof. Berry on the Upper Cretaceous floras of the eastern Gulf region in Tennessee, Mississippi, Alabama, and Georgia has been published as Professional Paper 112.

TEXAS.

Observations of drilling in progress in the "Red Beds" region of Texas, with sampling of saline deposits and brines and the collection of well logs, was continued by Orby C. Wheeler as a part of the search for potash in the "Red Beds" region of the Southwest. This work was done in cooperation with the State University Bureau of Economic Geology and Technology. A report by Mr. Wheeler and W. B. Hicks on potash and bromine in the brines and samples from shallow borings in and about the alkali lakes in Linn, Terry, and Gaines counties has been submitted for publication as a bulletin of the Survey. A preliminary note on the potash resources of the area

is included in the report on the production of potash in 1919. The general geology and physiography of this lake region was examined by P. S. Smith in company with Mr. Wheeler, whose headquarters are at Amarillo.

The salt deposits of the "Red Beds" region are discussed by N. H. Darton in a report on Permian salt deposits of the United States, submitted for publication as Bulletin 715-M. The gypsum deposits of the State are described by R. W. Stone in a general report on gypsum deposits in the United States (Bulletin 697).

The reconnaissance examination, with geologic mapping, of the Coastal Plain in southwestern Texas between the Rio Grande and Nueces River, begun by G. C. Matson prior to his resignation, was continued by A. C. Trowbridge and A. G. Maddren. The area covered embraces parts of Maverick, Zavalla, Dimmit, Webb, Duval, Zapata, Starr, Jim Hogg, and Brooks counties. Mr. Maddren resigned early in the year, and the work was resumed in June by Prof. Trowbridge, assisted by W. S. Glock. A report on the geology of the region is now in preparation.

Fossils from the Texas Coastal Plain have been studied by C. W. Cooke and Julia Gardner, and drill cuttings have been examined, with reference to their physical and mineral constitution, by M. I. Goldman and Mr. Cooke.

The systematic description of the fauna of the Comanche series (Lower Cretaceous) was resumed by T. W. Stanton. Reports on Eocene invertebrates were made by W. H. Dall, and Tertiary fossils from deep wells were identified by W. C. Mansfield.

The manuscript of a report by Alexander Deussen on the ground waters of the Coastal Plain of Texas west of Brazos River has been revised for publication. The report by Mr. Deussen on the geology of the Coastal Plain region between Brazos and Nueces rivers is in preparation for publication as a professional paper.

The middle and upper Eocene floras of Texas are described by E. W. Berry in a manuscript now awaiting publication. A paper by Prof. Berry entitled "An Eocene flora from trans-Pecos Texas" has been issued as Professional Paper 125-A. The early Tertiary Bryozoa of the State are described by F. Canu and R. S. Bassler in a monograph prepared under Survey auspices but issued as Bulletin 106 of the United States National Museum.

Stratigraphic and structural studies, with reference to oil problems, were continued during parts of the year in north-central Texas, mainly in Eastland and Stephens counties, by Frank Reeves, C. S. Ross, A. G. Argabrite, F. H. Burton, and E. S. Bleeker. With the cooperation of the oil companies drill cuttings were collected from several places and studied in the office of the Survey. The microscopic fossils from the several horizons represented have been exam-

ined and described by P. V. Roundy, and the lithologic and chemical characteristics of the beds have been studied by M. I. Goldman. These researches have proved both laborious and difficult, but they promise to be of great value to drillers in other regions where oil is found in Carboniferous beds as well as in Texas. Manuscripts covering parts of the area mapped by the geologists are now nearly ready to submit for publication, and a report on the subsurface lithology of the north-central Texas oil field by Mr. Goldman is now well advanced. The fauna of the "Bend formation" is being described by G. H. Girty.

At the request of the mayor of Dallas an investigation of the gas resources tributary to Dallas and other cities of north Texas was made, special attention being given to a new estimate of the contents of the Petrolia field. The principal conclusions reached by E. W. Shaw and P. L. Ports, representing the Geological Survey in this examination, which was conducted under a cooperative arrangement, were promptly communicated to the mayor and issued to the press. A more detailed report by these geologists is now in course of publication as Bulletin 716-D. In connection with the appraisal of the gas resources in the Petrolia field an estimate of the helium content of the field was made by Messrs. Shaw and Ports at the request of the Navy Department, to which the results were communicated. A description of the mode of occurrence and an earlier quantitative appraisal of the helium in the Petrolia field by the late G. S. Rogers will be found in Professional Paper 121, entitled "Helium-bearing natural gas," now in press.

The stratigraphy and geologic structure of parts of Grayson, Fannin, and Collin counties and adjacent territory are described and mapped, with special reference to the oil and gas resources, in a report by O. B. Hopkins, Sidney Powers, and H. M. Robinson, now in preparation for publication.

The sulphur fields of west Texas were visited by P. S. Smith, who investigated the results of recent economic development. Eocene fossils from this region were examined by Julia A. Gardner, and fossil corals by T. W. Vaughan.

At the request of the Department of Justice E. W. Shaw made a study of the evidence as to the method of recent migration of Red River in the vicinity of Burkburnett. The ownership of the rich oil deposits beneath the river is dependent on the method and date of the changes in the channel of the river.

UTAH.

Examinations in the Cottonwood-American Fork region, Utah, were continued by B. S. Butler and F. C. Calkins; detailed areal

mapping of the district was done by Mr. Calkins, and the ores and mining geology was studied by Mr. Butler, who in June resigned to engage in private work. It is hoped that arrangements may be made with Mr. Butler for the completion of his report. Cambrian fossils from this district were identified by Edwin Kirk, and Carboniferous invertebrates by G. H. Girty.

The structure of the region embracing the Virgin City oil field, in southwestern Utah, was examined by J. B. Reeside, jr., and Harvey Bassler, and a report on the oil prospects there has been submitted. The more important conclusions regarding the geologic structure and oil and gas prospects were issued in the press at the end of the field season. A report on the stratigraphy of a part of southwestern Utah is in preparation by these two geologists. A report on the Carboniferous invertebrates in the region examined by Messrs. Reeside and Bassler was made by G. H. Girty.

To supply a demand due to the great interest in the prospects of finding new oil fields in the State, Bulletin 691-A, entitled "The Farnham anticline, Carbon County, Utah," by F. R. Clark, was reprinted. It has also been necessary to reprint Bulletin 691-B, "Oil shale of the Uinta Basin," by D. E. Winchester.

The regions in the northeastern part of the State where oil shale is being developed were visited by Mr. Bassler, who gave close attention to the work now in progress in the utilization of the shale for the production of oil. A report on oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah, by D. D. Condit, has been issued as Bulletin 711-B.

Additional observations were made by M. R. Campbell along the route of the Denver & Rio Grande Railroad in order to complete the manuscript for the guidebook submitted by him for publication as a bulletin. The purpose of this report is mainly educational.

The manganese ores developed at several points in Utah are described by J. T. Pardee in a report on manganese ore in Montana, Utah, Oregon, and Washington, which is now ready for publication in "Contributions to economic geology."

The report by F. R. Clark on the Sunnyside and Wellington quadrangles has been partly revised by M. R. Campbell. A report on the geology of the Lost Creek coal field, Morgan County, by Mr. Clark, has been printed as Bulletin 691-I.

The chapter on land sculpture in the monograph by the late G. K. Gilbert on the geology of the Henry Mountains was reviewed by the physiographic committee with reference to its republication.

VIRGINIA.

The detailed examination, with mapping, of the Virginia coal field was continued by C. K. Wentworth, in cooperation with the Virginia

Geological Survey, which was represented by A. W. Giles. The work of the field season of 1919 lay chiefly in the western part of the coal field. A report on the geology and coal resources of Russell County is at an advanced stage of preparation by Mr. Wentworth for publication by the State. J. B. Eby assisted Mr. Wentworth in office work in the spring and in field work in June. A description of the Russell Fork fault, in Dickinson and Buchanan counties, was prepared by Mr. Wentworth for unofficial publication.

A report based in part on field examinations of certain areas of Pocono coal in Virginia is in preparation by M. R. Campbell. A paper by C. C. Osborn on peat in the Dismal Swamp, Virginia and North Carolina, has been published as Bulletin 711-C.

The manganese deposits of the State are described in a report by G. W. Stose, which was transmitted for publication in the *Engineering and Mining Journal*. Detailed descriptions of some manganese mines of the State are being prepared by H. D. Miser for a report on manganese deposits of the western part of the Valley of Virginia, in cooperation with the State Geological Survey, for publication by the State.

Further field studies of the phosphate, gypsum, and salt deposits in the Abington quadrangle were made by G. W. Stose. A paper on the gypsum deposits of the Saltville region by Mr. Stose is incorporated in Bulletin 697, "Gypsum deposits in the United States," by R. W. Stone, now in press.

The principal deposits of white clay in the State are described by Heinrich Ries in Bulletin 708, "High-grade clays of the eastern United States," now in preparation for publication.

Parts of the Piedmont region of Virginia were reviewed by Laurence LaForge for description in the Piedmont chapter of the handbook of the geography of Maryland, Delaware, and the Virginias. Further field studies were made by W. T. Lee of the inter-stream regions of the Gulf Coastal Plain in order to complete the manuscript on the corresponding chapter of this handbook. The valley region is being described by G. W. Stose; the Allegheny region by M. R. Campbell.

Tertiary Bryozoa from different localities in the Coastal Plain have been described by F. Canu and R. S. Bassler in a report prepared under Survey auspices but published by the United States National Museum. Additional collections of Miocene Bryozoa made by Mr. Lee and others in 1918 have also been studied and described by Messrs. Canu and Bassler. Field studies of the stratigraphy and paleontology of the older Paleozoic formations of the Appalachian Valley in the vicinity of Staunton, Lexington, and Wytheville were made by E. O. Ulrich, Charles Butts, and R. D. Mesler for purposes of interstate correlation. Special examinations for purposes of

correlation and for the collection of fossils from the Carboniferous beds in the southwestern part of the State were made by G. H. Girty and T. E. Williard. Fossil plants from the Potomac group were identified by F. H. Knowlton, and Pleistocene fossils from various localities were studied by W. H. Dall.

VERMONT.

A report on the structure of the Taconic Range, Vt., is being prepared by Arthur Keith.

The granite resources of the State are described by T. Nelson Dale in the bulletin on commercial granites of New England now in preparation.

WASHINGTON.

Coal lands in Lewis County, Wash., were examined and data for their classification were collected by E. J. Saunders, through the cooperation of the Geological Survey of Washington.

The geology of an area near the Rattlesnake Hills was briefly studied by J. P. Buwalda with reference to the possible occurrence of oil and gas in the area.

The manganese deposits and the chromite ores of the State are described by J. T. Pardee in two papers submitted for publication. An article on bementite from western Washington was transmitted by Mr. Pardee for publication in the American Journal of Science.

Reports on Tertiary and Quaternary fossils from western Washington were made by W. H. Dall.

WEST VIRGINIA.

Reconnaissance observations of parts of the Romney, Piedmont, and Winchester quadrangles, W. Va., were made by G. W. Stose in preparation for the description of the valley region in the geographic handbook of Virginia, West Virginia, and Maryland. Some geologic data were also obtained in the Romney region.

Several of the mines in the Tug Fork coal field, along the Kentucky border, were sampled by J. D. Sears to ascertain the quality of the coal and the stage of carbonization, for use in determining the possible southwestern boundary of the Appalachian oil field.

A report on the Abram Creek-Stony River coal field, in northeastern West Virginia, by G. H. Ashley, has been issued as Bulletin 711-F.

Observations of the temperatures of deep wells in the State have been made by C. E. Van Orstrand with the cooperation of the State geologist, Dr. I. C. White, who has also interpreted the logs.

WISCONSIN.

The glacial deposits in northern Wisconsin are described by Frank Leverett in a report on moraines and shore lines of the Lake Superior basin, now nearly ready for submission.

Brief field examinations of the stratigraphy and paleontology of the older Paleozoic formations in the State were made by E. O. Ulrich in cooperation with the State geologist, with a view principally to demonstrating the systemic rank and relations of the Ozarkian and Canadian divisions, previously proposed by Mr. Ulrich.

WYOMING.

The areal geology and structure of the Lance Creek, Mule Creek, and Rock Creek oil districts were mapped by E. T. Hancock with the assistance of C. E. Dobbin, who also collected data on development in the Upton-Thornton region. Reports by Mr. Hancock on the Mule Creek and Lance Creek fields are now in press as Bulletins 716-C and 716-E. A report on the Upton-Thornton oil field by Mr. Hancock has been issued as Bulletin 716-B.

Reports on oil in the Warm Springs and Hamilton domes, near Thermopolis; on gas in the Big Sand Draw anticline, Fremont County; and on anticlines near Maverick Springs, Fremont County, by A. J. Collier, have been issued as Bulletins 711-D, 711-E, and 711-H, respectively.

A report on the geologic structure of parts of the Crow Indian Reservation with reference to oil and the possible occurrence of gas has received attention from C. H. Wegemann and C. K. Wentworth, but owing to the commercial demands on the time of Mr. Wegemann, who is not now a member of the Survey, and the interruptions occasioned by Mr. Wentworth's work in Virginia this report is not yet completed.

In the spring of 1920 the Osage oil district was mapped by A. J. Collier, and near the end of the year he extended his examination to include points of new discoveries to the north.

Additional examinations of structural details and the results of development near Oregon Basin, Little Buffalo, Grass Creek, and Cottonwood Creek were made by D. F. Hewett, who procured information for use in his general geologic report covering several quadrangles embracing these fields. The Hart Mountain overthrust was investigated by Mr. Hewett and described by him in a paper transmitted for unofficial publication. The report by Mr. Hewett and C. T. Lupton on anticlines in the southern part of the Big Horn Basin (Bulletin 656) has been reprinted in response to the urgent demand for information on this region.

The Baxter Basin, in Sweetwater County, is described by A. R. Schultz, with reference particularly to its oil and gas prospects, in Bulletin 702, now in press.

A report on the geology and oil and gas resources of Wyoming, prepared and submitted by W. B. Emery, has been reviewed and transmitted for publication as Bulletin 689-A. A geologic map to accompany this report has been prepared under the direction of M. R. Campbell, and the oil fields and pipe lines of the State have been mapped under the supervision of G. B. Richardson.

The region embracing what is known as the Big Piney oil field was examined for the purpose of classifying the land by E. H. Finch, with the assistance of N. W. Bass, of the land-classification board. The salient conclusions were transmitted to the press in the autumn of 1919.

Detailed examinations of a part of the Kemmerer coal field were also made by Messrs. Finch and Bass with reference to the coal content of some of the sections. Samples of oil shale from the southwestern part of the State were examined and tested with reference to their oil content by Harvey Bassler.

Publication of the report on the Elk Basin oil field by C. J. Hares has been delayed two years awaiting revision of certain points by the author, who is no longer a member of this Survey.

A report entitled "Oil shale in western Montana, southeastern Idaho, and adjacent parts of Wyoming and Utah," by D. Dale Condit, has been published as Bulletin 711-B.

In cooperation with the land-classification board, several of the oil geologists of the geologic branch have been engaged in the definition of the known geologic structure of anticlines in Wyoming.

A manganese deposit in Wyoming is described by E. L. Jones, jr., in Bulletin 715-C, and the gypsum resources of the State are discussed by R. W. Stone in Bulletin 697.

The description of the invertebrate fauna of the Eagle sandstone in northern Wyoming was begun by J. B. Reeside, jr., and Cretaceous plants from various localities were studied by F. H. Knowlton. Invertebrates from the Cretaceous beds at a number of points were examined by T. W. Stanton, and reports on Carboniferous fossils from several localities were made by G. H. Girty.

HAWAIIAN ISLANDS.

Late in the winter L. F. Noble was detailed to the water-resources branch for studies of the lava flows and sediments of the Hawaiian Islands. The lavas are now under petrographic study by Mr. Noble.

The recent marine molluscan fauna of the islands is being made the subject of a comprehensive review by W. H. Dall, based chiefly on the collection of S. Thaanum, of Hilo, Hawaii, and the collection of the Bureau of Fisheries. Tertiary fossils from the islands have also been examined by W. H. Dall.

WEST INDIES.

Porto Rico.—A report on the ground waters of eastern Porto Rico and the larger Virgin Islands of the United States has been prepared by T. W. Vaughan. The Tertiary fossils from these islands have been reviewed by W. H. Dall, with the exception of the Foraminifera collected by Mr. Vaughan, which have been studied by J. A. Cushman.

Virgin Islands of the United States.—The report on the ground waters of the larger Virgin Islands of the United States, investigated at the request of the Navy Department, has been submitted by T. W. Vaughan. Fossil Foraminifera collected in the course of the field investigations have been examined by J. A. Cushman. Studies of the stratigraphy and paleontology and correlations of the geologic formations of the islands were made by T. W. Vaughan.

Cuba.—Manganese deposits in the island of Cuba were examined in May by D. F. Hewett, at the request of the War Minerals Relief Commission.

A report on the chromic iron ores of Cuba has been compiled by E. F. Burchard and will be found in Mineral Resources for 1918. The chrome and manganese ores of Cuba have been described by Mr. Burchard in the Transactions of the American Institute of Mining and Metallurgical Engineers.

Preliminary examinations of samples of well drillings have been made by J. A. Cushman. Some Tertiary Mollusca of Cuba are discussed by C. W. Cooke and Tertiary Foraminifera by J. A. Cushman in an unofficial publication.

Dominican Republic.—The publication of a report on the preliminary geologic reconnaissance of the Dominican Republic has been authorized by the Government of the Republic. Chapters on the structural, stratigraphic, petrologic, and mineralogic features are contributed by C. W. Cooke, D. D. Condit, and C. P. Ross. The Tertiary and Quaternary stratigraphic paleontology is discussed by T. W. Vaughan and W. P. Woodring. The Cretaceous invertebrates were determined by T. W. Stanton; the Tertiary invertebrates by T. W. Vaughan, J. A. Cushman, W. P. Woodring, and W. C. Mansfield; the fossil plants by E. W. Berry. In an unofficial publication J. A. Cushman described Miocene Foraminifera from the Dominican Republic.

Republic of Haiti.—Office work preliminary to the cooperative geologic survey of Haiti under the direction of T. W. Vaughan, chief of the section of Coastal Plain investigations, has included studies of the available geologic data on the Republic by W. P. Woodring and the examination of Tertiary invertebrates already in hand by J. A. Cushman, T. W. Vaughan, and W. P. Woodring.

Other islands.—Fossil Foraminifera from Barbados were examined by J. A. Cushman, and Tertiary fossils from Trinidad were studied by T. W. Vaughan, J. A. Cushman, and W. P. Woodring. Cretaceous invertebrates found in Jamaica were reported on by T. W. Stanton; and Tertiary Mollusca from the Leeward Islands have been described in an unofficial publication by C. W. Cooke.

MEXICO AND CENTRAL AMERICA.

Pleistocene fossils from Mexico and Panama and Tertiary Mollusca from Panama have been reported on by W. H. Dall; and Tertiary fossils from Costa Rica have been submitted to Mr. Dall and J. A. Cushman for examination.

Deposits of manganese ore in Costa Rica and Panama are described by J. D. Sears in Bulletin 710-C.

SOUTH AMERICA.

Reports on collections of Mesozoic invertebrates from Colombia and Brazil were made by T. W. Stanton, and Tertiary fossils from Colombia were examined by W. C. Mansfield and W. P. Woodring.

Pleistocene fossils from Peru submitted by the Brooklyn Museum have been reported on by W. H. Dall, and invertebrate fossils, probably of Devonian age, collected on the east slope of the Andes in Bolivia are under review by G. H. Girty. Tertiary invertebrates from Venezuela, Ecuador, and the Galapagos Islands were examined by W. H. Dall.

CANADA.

Cretaceous fossils from Alberta have been studied by T. W. Stanton, and Pleistocene invertebrates from Saskatchewan by W. H. Dall. Reports on upper Paleozoic fossils from New Brunswick and Nova Scotia have been made by G. H. Girty, and on Pleistocene shells from Vancouver Island, British Columbia, by W. H. Dall. These collections were studied for the Geological Survey of Canada.

OTHER COUNTRIES.

Potash deposits of Alsace, examined by H. S. Gale in 1919, are described in Bulletin 715-B and the results of investigations by Mr.

Gale in the vicinity of Barcelona, Spain, are published in Bulletin 715-A. Fossil Mollusca from mineral localities in France, submitted by the Museum of Natural History in Paris and by the Municipal Museum of Nice, were examined by W. H. Dall.

Tertiary fossils from Cassel, Germany, have been reported on by W. H. Dall, who also examined Tertiary Mollusca from South Africa.

In cooperation with the Carnegie Institution T. W. Vaughan prepared a preliminary list of the corals of the Samoan Islands.

DIVISION OF ALASKAN MINERAL RESOURCES.

PERSONNEL.

On July 1, 1919, the personnel of the division of Alaskan mineral resources consisted of 1 geologist in charge, 7 geologists, 4 topographers, 1 hydraulic engineer, 1 draftsman, and 2 clerks on annual salaries and 12 temporary field employees. On June 30, 1920, the personnel included 1 geologist in charge, 6 geologists, 2 topographers, 1 hydraulic engineer, and 2 clerks on annual salaries and 1 geologist on a monthly salary.

APPROPRIATION AND CLASSES OF WORK.

In 1918 the appropriation for the investigation of the mineral resources of Alaska was reduced from \$100,000 to \$75,000. This reduction was made with the approval of the Director because the technical staff of the Alaska service was greatly depleted, owing to the engagement of the men in war service, and investigations in Alaska were not believed to be directly connected with the winning of the war. Unfortunately, however, the appropriation has not yet been restored to its pre-war amount, being still only \$75,000. In addition to this reduction the increased cost of transportation, horses, supplies, wages of camp hands, etc., has forced a reduction of about 50 per cent in the field work. As a result the Alaska investigations are much in arrears, at a time when the large expenditures for Government railroad construction demand that every effort be made to encourage the mining industry. It would therefore be wise business policy on the part of the Government to stimulate the mining industry by increasing the knowledge of the distribution and occurrence of the mineral resources of Alaska through surveys and investigations. The division has had the additional handicap of losing the services of a large number of its most experienced technical employees. Attracted by higher salaries, six of the Alaska geologists have during the year gone temporarily or permanently into private work. Three of the Alaska topographic engineers are also on fur-

lough in private work, and two are still in the Army. As it takes many years to build up an efficient technical staff, the cost to the Government of restoring the force is much larger than the payment of salaries that will hold good men in the service.

The Alaska work of the year, like that of the past, has consisted in the making of surveys and investigations of mineral resources, including the preparation of the necessary topographic base maps. Special emphasis has been placed on surveys of the regions tributary to the Government railroad. It should be noted, however, that mining advances in any part of the Territory will directly or indirectly benefit the railroad. The water-power investigations have been continued in southeastern Alaska. These benefit not only the mining but also the wood-pulp and other industries.

FIELD WORK DURING SEASON OF 1919.

Twelve parties were engaged during 1919 in Alaskan surveys and investigations. The length of the field season ranged from 1 to 12 months, being determined by the character of the work and by the climatic conditions prevailing in different parts of the Territory. The parties included 2 geologists, 3 topographers, 1 engineer, and 12 packers, cooks, and other auxiliaries. Eight of the parties were engaged in geologic surveys, three in topographic surveys, and one in stream gaging. The areas covered by reconnaissance geologic surveys on a scale of 1:250,000 (4 miles to an inch) amount to 2,700 square miles. Much of the time of the geologists was devoted to the investigation of special problems relating to the occurrence of minerals, the results of which can not be expressed in terms of area. About 2,300 square miles was covered by reconnaissance topographic surveys on a scale of 1:250,000 (4 miles to an inch). In cooperation with the Forest Service, stream gaging was continued in southeastern Alaska.

Of the parties whose work may be classified geographically, two parties worked in southeastern Alaska, three in the Cook Inlet-Susitna region, and one each in the Yukon, Copper River, and Kuskokwim regions and Seward Peninsula.

The funds available for field and office work relating to the field season of 1919 included an appropriation of \$75,000 for the fiscal year ending June 30, 1920, and the unexpended balance of the appropriation for the year ending June 30, 1919, of which about \$16,700 was used in equipping parties for the season's field work. The following tables show the allotments, including both field and office work, of the total funds classified by regions, by kinds of surveys, and by kinds of expenditures. In the first table the general office expenses are apportioned to the several allotments, account being taken of variations

in character of work. The results are expressed in round numbers. Salaries of the permanent staff, other fixed charges, and the total allotments for the work of the office at Anchorage are included up to the end of the fiscal year 1920, but expenses other than these include only the cost of field and office work during 1919. The "general investigations" include, among other things, the cost of collecting mineral statistics and of office work relating to the field investigations of previous seasons. A balance of about \$10,400 from the appropriation for the year ending June 30, 1920, is available for equipping the field parties in 1920.

Approximate general distribution of appropriations for Alaska investigations, field season 1919.

	1918-19	1920
Southeastern Alaska.....	\$500	\$18,200
Copper River region.....		1,800
Cook Inlet and Susitna basin.....	13,200	22,900
Yukon basin.....		2,800
Kuskokwim region.....	8,000	8,700
General investigations.....		15,700
To be allotted to field work, 1920.....		10,400
	16,700	75,000

Approximate allotments to different kinds of surveys and investigations, field season 1919.

	1918-19	1920
Reconnaissance geologic surveys.....	\$8,600	\$17,600
Special geologic investigations.....		9,900
Reconnaissance topographic surveys.....	8,100	9,800
Investigation of water resources.....		4,200
Collection of mineral statistics.....		1,900
Miscellaneous, including administration, inspection, clerical salaries, office supplies and equipment, and map compilation.....		21,200
To be allotted to field work, 1920.....		10,400
	16,700	75,000

Allotments for salaries and field expenses, field season 1919.

	1918-19	1920
Scientific and technical salaries.....		\$33,458
Field expenses.....	\$16,700	15,421
Clerical and administrative salaries and miscellaneous expenses.....		15,721
To be allotted to field work, 1920.....		10,400
	16,700	75,000

The following table exhibits the progress of investigations in Alaska and the annual grant of funds since systematic surveys were begun in 1898. It should be noted that a varying amount is spent

each year on special investigations that yield results which can not be expressed in terms of area.

Progress of surveys in Alaska, 1898-1919.

Year.	Appropriation.	Areas covered by geologic surveys.			Areas covered by topographic surveys. ^a				Investigations of water resources.		
		Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000).	Detailed (scale 1:62,500).	Exploratory (scale 1:625,000 or 1:1,000,000).	Reconnaissance (scale 1:250,000; 200-foot contours).	Detailed (scale 1:62,500; 25, 50, or 100-foot contours).	Lines of levels.	Bench marks set.	Gaging stations maintained part of year.	Stream volume measurements.
1898	\$46,189	Sq. m. 9,500	Sq. m.	Sq. m.	Sq. m. 12,840	Sq. m. 2,070	Sq. m.	Miles.			
1899	25,000	6,000			8,690						
1900	60,000	3,300	6,700		630	11,150					
1901	60,000	6,200	5,800		10,200	5,450					
1902	60,000	6,950	10,050		8,330	11,970	96				
1903	60,000	5,000	8,000	96		15,000					
1904	60,000	4,050	3,500		800	6,480	480	86	19		
1905	80,000	4,000	4,100	536		4,880	787	202	28		
1906	80,000	5,000	4,000	421		13,500	40			14	288
1907	80,000	2,600	1,400	442		6,120	501	95	16	48	457
1908	80,000	2,000	2,850	604		3,980	427	76	9	53	556
1909	90,000	6,100	5,500	450	6,190	5,170	444			81	703
1910	90,000		8,635	321		13,815	36			69	429
1911	100,000	8,000	10,550	496		14,460	246			68	309
1912	90,000		2,000	525			288			69	381
1913	100,000	3,500	2,950	180	3,400	2,535	287				
1914	100,000	1,000	7,700	325	600	10,300	10				
1915	100,000		10,700	200		10,400	12	3	2	9	
1916	100,000		5,100	636		9,700	67			20	
1917	100,000		1,750	275		1,650				19	
1918	77,000		3,500			1,200					
1919	75,000		2,700			2,300				19	
		73,200	107,485	5,507	51,680	151,530	3,731	462	74		
Percentage of total area of Alaska.		12.48	18.33	0.94	8.81	25.83	0.64				

^a The Coast and Geodetic and International Boundary surveys and the General Land Office have also made topographic surveys in Alaska. The areas covered by these surveys are of course not included in these totals.

General work.—Alfred H. Brooks, geologist in charge of the division of Alaskan mineral resources, left for Alaska August 5 and returned September 30. With John A. Hallowell, assistant to the Secretary of the Interior, he visited the Alaska Railroad, traveling along its entire route to Fairbanks. Special attention was paid to the mineral resources tributary to the railroad, including the Matanuska coal field and the Fairbanks district. A visit was also paid to the Kennecott group of copper mines in the Chitina Valley.

On April 22, 1920, Mr. Brooks was detailed by the Secretary of the Interior as chairman of the Alaska Advisory Committee. The work

of this committee took most of his time until June 11 and considerable since then. It included a three weeks' journey to Seattle and return.

Mr. Brooks, as will be shown, has also given considerable of his time to the preparation of certain reports based on his work with the American Expeditionary Force and the Commission to Negotiate Peace. As a result of the various activities not connected with the work of the Alaska division, Mr. Brooks has prepared for publication the following reports and articles:

Iron and steel industries of Lorraine, Luxemburg, the Sarre district, and Belgium, by Alfred H. Brooks and Morris F. La Croix: U. S. Geol. Survey Bull. 703, 1920.

Military mining: Office of Chief Engineer, U. S. A., Occasional Papers, No. 62, 1920.

The use of geology on the western front: U. S. Geol. Survey Prof. Paper 128-D, 1920.

Influence of geography on the conduct of war (abstract): Pennsylvania Dept. Public Instruction, Educational Cong., 1919, Proc., pp. 540-547, 1920.

Military mining in France: Eng. and Min. Jour., vol. 109 pp. 606-610, 1920.

Application of geology to war (abstract): Eng. and Min. Jour., vol 109, p. 764, 1920; Washington Acad. Sci. Jour., vol. 10, pp. 331-333, 1920.

George C. Martin devoted much time to the administrative work of the Alaska division during Mr. Brooks's assignments to other duties. In addition he devoted a month to preparing the progress report and four months to his report on the oil fields of Alaska.

Arthur C. Hollick was engaged in a study of the Cretaceous flora of Alaska from December 3, 1919, to June 30, 1920. His report on this work is practically completed.

Miss Lucy M. Graves, chief clerk of the division, has assisted the geologist in charge in administrative duties. Much of the work of compiling the statistics of the mineral production of Alaska has been done by T. R. Burch.

Southeastern Alaska.—The investigation of the water resources of southeastern Alaska, begun in 1915 under a cooperative agreement with the Forest Service, was continued throughout 1919. G. H. Canfield, who had charge of this work, maintained automatic gages throughout the year. In addition to these gages others were installed in cooperation with individuals and corporations. The results are briefly summarized in another section of this report. This work could not have been carried on without the cordial cooperation of the Forest Service, many members of which have given substantial aid; particular acknowledgment should be made to C. H. Florey, forest supervisor at Ketchikan.

A reconnaissance of the geology and mineral deposits of parts of the Glacier Bay and Lynn Canal regions was made by J. B. Mertie, jr. Field work was begun on July 23 and continued until September 18. An area of about 200 square miles was mapped in

reconnaissance. Mr. Mertie also visited the productive mines of the Juneau and Ketchikan districts.

Copper River region.—The completion of the report on the Kot-sina-Kuskulana district, which was suspended by the assignment of F. H. Moffit to work for the War Department during the war, required the gathering of a small amount of additional field data in order to bring it up to date. Mr. Moffit spent September in this work.

Cook Inlet and Susitna regions.—Because of the importance of the region tributary to the Government railroad and the growing demand for information concerning it, a special effort is being made to complete the mapping of that region. The work in the Cook Inlet and Susitna regions in 1919 included a topographic and geologic reconnaissance survey of areas between Talkeetna River and Broad Pass and in the upper Kantishna region and detailed investigations at the coal mines in the Matanuska Valley.

A party in charge of S. R. Capps, assisted by S. H. Cathcart, made reconnaissance surveys, on the scale of 1:180,000, of an area of about 300 square miles in the high mountains on the headwaters of the Kantishna and of the upper tributaries of the Susitna. T. P. Pendleton, attached to this party, made topographic surveys of the same area. The party began field work on the north side of the Alaska Range June 28, finished its work August 27, having crossed the Alaska Range, and came out by way of Susitna River.

A topographic reconnaissance survey of an area adjacent to the Government railroad between Talkeetna River and Broad Pass was made by J. R. Eakin from June 22 to September 12. An area of about 600 square miles was mapped on a scale of 1:180,000. R. M. Overbeck completed geologic surveys of the same area.

The Alaska office at Anchorage was continued under charge of Theodore Chapin until February 1, 1920. Mr. Chapin, at his own request, was then furloughed to go to Mexico. His principal work has been as geologic adviser to the Alaskan Engineering Commission, with relation to the development of the Matanuska coal field, but he also made some investigations of copper and gold deposits of the region tributary to the railroad. It has been impossible to find an experienced geologist to take over this important work, and the Anchorage office has therefore been temporarily closed.

Yukon region.—The placer mines of the Eagle and Circle districts were visited by G. C. Martin from August 16 to September 13 for the purpose of obtaining information concerning recent mining conditions and developments.

Goodnews Bay.—Topographic and geologic reconnaissance surveys of an area in the vicinity of Goodnews Bay and the lower Kus-kokwim were made by a party in charge of R. H. Sargent. Mr. Sar-

gent mapped topographically an area of 1,400 square miles for publication on the scale of 1:250,000. G. L. Harrington, who accompanied Mr. Sargent's party, made a reconnaissance geologic map of an area of about 2,000 square miles. Field work began July 4 and ended August 17.

Seward Peninsula.—After the end of his field work in the Kuskokwim region G. L. Harrington made investigations of general mining developments in Seward Peninsula. He was engaged in this work till October.

FIELD WORK, 1920.

Alfred H. Brooks is to undertake geologic examinations in the Prince William Sound region and the Ketchikan district, paying special attention to copper deposits. F. H. Moffit, geologist, and C. P. McKinley, topographic engineer, are engaged in making geologic and topographic reconnaissance surveys on the west side of Cook Inlet, including the Iniskin Bay oil field. J. R. Eakin is extending the topographic reconnaissance surveys in the upper Susitna basin. S. H. Cathcart is making special studies of the distribution and occurrence of mineral deposits in Seward Peninsula. The geology and mineral resources of the Richardson district of the Tanana Valley are to be investigated by P. S. Smith. Investigations of the water powers of southeastern Alaska are being continued by G. H. Canfield. In August G. C. Martin will make an examination of the mineral deposits of the McGrath district of the Kuskokwim Valley. W. G. Westgate is to undertake a geologic examination of the Portland Canal district.

COLLECTION OF STATISTICS.

The collection of the statistics of Alaska mineral production, begun by the Alaska division in 1905, was continued as usual. In 1919 this work was done by George C. Martin, assisted by T. R. Burch.

PUBLICATIONS.

During the year the Survey published two bulletins (Nos. 692 and 699) relating to Alaska. The separate chapters of Bulletin 712 were also issued during the year. Two Alaska bulletins (Nos. 682 and 712) are in press.

The following manuscripts are completed:

Chromite of Kenai Peninsula, Alaska, by A. C. Gill.

The geology of the Cape York tin deposits, by Edward Steidtmann and S. H. Cathcart.

The Kotsina-Kuskulana district, by F. H. Moffit.

Preliminary report on petroleum fields of Alaska, by George C. Martin (Bulletin 719).

The following reports are in hand:

The mineral resources of the region tributary to the Alaska Railroad, by S. R. Capps.

Geology and mineral resources of the White Mountain and Fort Hamlin region, by Elliot Blackwelder and R. M. Overbeck.

Geologic reconnaissance of the Goodnews Bay and lower Kuskokwim region, by G. L. Harrington and A. G. Maddren.

The Ruby-Kuskokwim region, by J. B. Mertle, jr., and G. L. Harrington.

The Ketchikan district, by Theodore Chapin.

The Upper Cretaceous floras of Alaska, by Arthur C. Hollick.

The Mesozoic stratigraphy of Alaska, by George C. Martin.

A number of other manuscript reports are on hand in various stages of completion. Many of them were written by geologists who have left the service. All of them will require more or less office work, and some will entail additional field work. Therefore, though these manuscripts are on hand, the time and form of their publication are so uncertain that it does not seem worth while to list them at present, though some have been included in previous administrative reports.

TOPOGRAPHIC MAPS READY FOR PUBLICATION.

Kotsina-Kuskulana district, by D. C. Witherspoon; scale, 1:62,500; contour interval, 100 feet.

Goodnews Bay region, by R. H. Sargent; scale, 1:250,000; contour interval, 200 feet.

Lower Kuskokwim and Goodnews Bay region, by R. H. Sargent and A. G. Maddren; scale, 1:500,000; contour interval, 400 feet.

Innoko-Iditarod region, by R. H. Sargent and C. E. Giffin; scale, 1:250,000; contour interval, 200 feet.

TOPOGRAPHIC MAPS IN PREPARATION.

Port Wells region, by J. W. Bagley; scale, 1:250,000; contour interval, 200 feet.

Jack Bay district, by J. W. Bagley; scale, 1:62,500; contour interval, 50 feet.

Fidalgo-Gravina district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Susitna-Chullitna district, by D. C. Witherspoon; scale, 1:250,000; contour interval, 200 feet.

Seward-Fairbanks route; compiled; scale, 1:250,000; contour interval, 200 feet.

DIVISION OF MINERAL RESOURCES.

Further reorganization of the division of mineral resources was necessitated during the year by resignations and furloughs. Edson S. Bastin, after serving as division chief from January 1, 1919, resigned on December 24 to accept a professorship of economic geology at the University of Chicago. F. J. Katz, administrative assistant, was furloughed in September, 1919, to serve as expert special agent in charge of statistics of mines and quarries for the Bureau of the

Census. C. E. Leshner, in charge of statistical work on coal and coke, resigned in December to become statistician for the National Coal Association and later editor of the *Coal Age*. J. B. Umpleby, in charge of the section of foreign mineral reserves, resigned in August, 1919, to become professor of geology in the University of Oklahoma.

G. F. Loughlin, in charge of the metals section, succeeded Mr. Bastin as division chief, retaining direct supervision of the metals section. R. W. Stone continued in charge of the nonmetals section and also served as administrative assistant. F. G. Tryon assumed charge of the work on coal and coke, and Eugene Stebinger that on foreign reserves, but during Mr. Stebinger's protracted absence in South America the foreign work was supervised by B. L. Johnson.

Resignations and furloughs have also depleted the staff of specialists and clerks, and at present 17 subjects of greater or less scope are without direct supervision of geologist or engineer specialists. When the year began the division's staff included 44 such specialists, of whom 21 devoted all their time to work of the division, the rest dividing their time with the division of geology or that of chemical and physical research or the water-resources branch. At the end of the year only 25 specialists remained, of whom 16 devoted their entire time to the work of the division. The clerical force numbers 49. The intensive work during the war resulted in systematic assembling of information, and it has thus far been possible for the more experienced members of the clerical force, under supervision of the section chiefs, to supply most of the technical information requested on these subjects. This situation can continue for a time during the period of unsettled industrial conditions, but sooner or later these vacancies must be filled.

Coincident with this shrinkage in the sections handling metals and nonmetals in general, there has been necessary expansion in the section handling mineral fuels. The work on coal and coke, which expanded from a force of 6 before the war to a maximum of 450 when cooperation was effective with the Fuel Administration, has maintained a much broader scope than it had before the war, and the force now numbers 11. Weekly reports on production were continued only by the active cooperation of the National Coal Association, which supplied 4 clerks for this work; numerous special reports also were prepared for different Government bureaus and commissions.

During the strike of the bituminous miners in November and December, 1919, C. E. Leshner sat as a member of the Central Coal Committee, to which the Director General of Railroads and the Fuel Administrator intrusted the task of distributing coal during the strike. For the information of officials of the Government during that

critical period a daily bulletin on the coal supply was circulated. In addition, the section prepared many special reports on particular phases of consumption and distribution, which were used by the committee in its task of apportioning the coal available.

The agitation for an embargo on exports also laid a heavy burden on the fuel section, which was called upon to furnish information to be used in determining the policy of the United States with regard not only to restricting exports of coal but also in expediting the movement to New England and to the Northwest. With the assistance of funds furnished by the Bituminous Coal Commission a canvass of stocks in the hands of 5,500 representative consumers and an analysis of the production, by regions, and the distribution of the coal actually produced during the first six months of the year were undertaken.

The petroleum situation has shared honors with coal in its command of public attention, and the demands on the division of mineral resources have been correspondingly increasing. The monthly report showing statistics of production, shipments, and stocks has been amplified, and further development of it is in progress. Requests for information on the oil industry are received daily from all parts of the country. Before the war one specialist and four clerks handled this subject. Owing to the growing need for more and more prompt information, two new clerks have been added to work on oil statistics.

Statistics of natural gas and natural-gas gasoline, formerly compiled by one clerk under occasional supervision of the petroleum specialist, were last year placed in charge of a specialist assisted by three clerks, who devote all their time to the subject. This expansion was timely, as the work had hardly been reorganized before the declining production and necessity for conservation of natural gas, evident for some time to close students of the subject, became so serious as to attract general attention, and the Survey's increased force has been kept busy in supplying current information.

The section of foreign mineral reserves, a product of the war, was at first organized with one specialist assigned to each continent, but owing to resignations it was necessary to reorganize it into a source of general statistical, geologic, and geographic information and to assign specialists to certain timely studies. Owing to the shifting of duties as well as to the changing nature of the work, little material for publication was finished during the year, but the section has been of great service to other Government organizations, to scientific societies, and to many large companies and individual citizens seeking information on foreign mineral resources. Many mineral commodities that are produced either in this country or abroad are of decided interest to some portion of the American people, because of our dependence on or competition with the foreign products, and

the section has thus far met an urgent and continuing need. Calls on it for information are many and various. In June, for example, 48 requests were received for information on 20 different commodities, including 16 for oil (mostly in Latin America but also in Canada, India, Persia, and Abyssinia), 5 for copper (principally in Europe), 3 for phosphate rock in North Africa, and 2 for general mineral resources of Latin America, and 6 requests for foreign geologic and other maps were received. Foreign oil is at present the subject of most lively interest, and a vast amount of information on it has been compiled and analyzed.

This work is most timely when an international view of the mineral industries is superseding a national or domestic view. It is capable of expansion whenever adequate means are provided. In this connection it may be remarked that Great Britain, our chief economic competitor, has, as a result of the war, developed the Imperial Mineral Resources Bureau to conduct work similar to that of this section, but with a larger personnel, which includes many of the ablest English engineers and economists.

The present activities of the section consist principally in furnishing general information on foreign mineral deposits—work which, like that on domestic resources, consumes a great deal of time but whose results do not appear in published form; building up bibliographies and abstract files which serve as bases for research on foreign mineral deposits and which are probably already the largest reference files to literature on foreign mineral deposits in the country; compiling official statistics of mineral production in foreign countries; preparing special reports on the mineral resources of foreign countries—for example, mineral resources of Asia Minor, oil in Latin America, graphite in Latin America, silver in Mexico, phosphate rock in Morocco; preparing world oil concession maps and text; translating and abstracting important literature on oil to meet the pressing demand for such information; preparing a world atlas of commercial geology.

The World Atlas of Commercial Geology was the first large piece of work undertaken by the section of foreign mineral reserves; most of the maps on production are in proof, and preparation of the text is practically completed. The maps and text dealing with mineral reserves of Europe are about 90 per cent complete, and preliminary drafts of reserve maps of Latin America and certain countries elsewhere have been completed.

All this work is at present being carried on by three geologists, only one of whom can devote all his time to this research, two mineral geographers, a geologic aid, and five clerks—a force in marked contrast to the large bureau doing similar work in Great Britain

and hardly adequate to supply even the present calls for information, which are steadily increasing.

The scope of work conducted by the western offices of the division of mineral resources at Denver, Salt Lake City, and San Francisco has long needed expansion. Heretofore the compilation of statistics of metal and ore production and the furnishing of information and distribution of Survey publications to visitors have consumed the entire time of the statisticians in charge and their assistants. The need of prompt geologic study of new developments in mining and of other geologic work that can not be adequately attended to from the Washington office has long been felt, and a beginning to supply this need has been made by assigning J. M. Hill as resident geologist, attached to the San Francisco office. Owing to the present depleted state of the geologic staff, it is impossible to assign geologists to the other offices at present, but such assignments are urgently needed.

Cooperation with the Bureau of the Census has, as in previous census years, greatly retarded the work of this division. Comparison with the state of progress a year ago shows that whereas on July 1, 1919, returns from producers were nearly complete for all commodities and tabulation for many of them was complete or well advanced, on August 1, 1920, only a small percentage of producers' returns have been received. At the present rate of progress the work of compiling data of production for 1919 will extend into 1921 and overlap the Geological Survey's own canvass for 1920, thus delaying the reports for both years.

The preparation of statistical reports by the specialists was necessarily retarded during the war by the priority given to emergency requests for information; so that the Census cooperation, coming just as the effects of war work were being overcome, will continue to delay the preparation of reports for perhaps two years more. Although this cooperative work is intended to avoid duplication of effort, both by the Government and by the producers of mineral commodities, the methods of work in the two bureaus and the objects sought are so different that, so far as the Geological Survey is concerned, cooperation serves only to increase the amount of labor required to compile statistical data, without improving the quality of the data. It is doubtful, indeed, if the amount of extra work saved to producers by this cooperative canvass by the two bureaus is appreciable, as the schedules of the two bureaus supplement rather than duplicate each other.

Reports of the division transmitted between July 1, 1919, and June 30, 1920, included the chapters on lead, zinc, and rare metals in 1917; the summary of mineral production for that year; all the

chapters for the 1918 volume except those on coke, artificial gas, lead, and zinc; and advance chapters for 1919 on fuel briquetting, cadmium, thorium minerals, bauxite and aluminum, magnesium, platinum, and arsenic, bismuth, selenium, and tellurium, all short chapters, prepared without cooperation with the Bureau of the Census. The delayed chapters for both the 1917 and 1918 volumes were those whose authors had been called upon for a great amount of urgent work which was given precedence. The more essential data in these chapters had been published long previously in press bulletins. Several similar press bulletins giving advance figures of production in 1919 were also published.

The first "Preliminary summary of mineral resources of the United States," for 1918, was published August 7, 1919, and, as expected, has met a considerable demand for general statistical information. The final summary is necessarily the last chapter of the annual volume to be prepared, and as it is impossible to publish all the more lengthy chapters, even under the most favorable circumstances, until 11 months or more after the year which they represent, the final summary and the complete volumes must appear even later, and the preliminary summary thus serves a timely purpose. Under normal working conditions it is hoped that the preliminary summary for each year can be published by the following June 1.

DIVISION OF CHEMICAL AND PHYSICAL RESEARCH.

FUNDS AND ORGANIZATION.

The work of the division of chemical and physical research was continued under the usual appropriation of \$40,000. Of this sum \$6,000 was allotted for the examination of reported deposits of potash and nitrates under the administration of the division of geology.

The personnel of the division on June 30, 1920, comprised seven chemists, two physicists, one laboratory aid, one clerk, one laboratory assistant, and one laborer. Chase Palmer, assistant chemist, resigned October 31, 1919, to accept a position with the Southern Pacific Co. W. T. Schaller, chemist, resigned January 31, 1920, to accept a position with a sulphur company, and W. B. Hicks, chemist, resigned February 15, 1920, to join the Solvay Process Co. J. G. Fairchild, assistant chemist, was appointed by transfer from the Bureau of Chemistry and reported for duty July 1, 1919. M. A. Shoultes, laboratory aid, was reinstated October 20, 1919, after his Army service. G. V. Brown, professor of chemistry at Bucknell University, received a temporary appointment in June, 1920.

WORK IN CHEMISTRY.

The chemical work of the division is under the immediate supervision of George Steiger, chief chemist. Toward the end of the year this work had returned to a pre-war status, consisting of qualitative and quantitative analyses and mineralogic determinations of rocks and minerals. The identification by visual inspection or simple tests of specimens received by the Survey from outside sources was greatly reduced, the bulk of this work having been taken over by the division of geology. A portion of the time of R. C. Wells and W. B. Hicks and the greater part of the time of W. T. Schaller was absorbed by their duties in connection with the preparation of reports for the division of mineral resources.

The chemical analyses made during the year numbered 1,013, of which 485 were qualitative tests, 416 tests for commercial qualities, and 112 made in connection with problems of scientific research. On June 30 there were pending 9 samples for commercial valuation and 15 samples involving research.

An elaborate and critical discussion of the quality of the surface waters of the United States is in preparation by F. W. Clarke. That portion of the work treating of the waters east of Mississippi River is practically completed. Mr. Clarke has also been engaged in a discussion, on a larger scale and with greater refinement than heretofore attempted, of the composition of the crust of the earth. This work is being done in cooperation with H. S. Washington, and the report will contain more than 5,000 analyses of igneous rocks. It will require the major portion of the coming fiscal year for the completion of these two reports.

Color-standard tubes for the determination of hydrogen-ion concentrations in sea water were prepared by R. C. Wells. This work entailed an exhaustive study and the careful determination of the hydrogen-ion concentration of various dilutions of sea water. Tubes, together with certain apparatus, were furnished to the Bureau of Fisheries for the oceanographic investigations carried on by that bureau, primarily for use in the study of the water of Chesapeake Bay. In cooperation with the Interdepartmental Conference on Chemical Lime, Mr. Wells made determinations of calcium in certain samples of quicklime by seven different methods of analysis, which were carried out also by several other laboratories. The object of the work was to compare results and to select the best analytical method.

An interesting new mineral, brannerite, containing helium, was analyzed and described by Mr. Wells. The helium gas was separated, purified, and definitely identified by the spectroscope. Mr. Wells also made an extremely accurate determination of chlorine in a stand-

ard sample of sea water. This work, which was undertaken for the Bureau of Standards, required the special purification of reagents used and is comparable with atomic-weight work.

The study, together with experiments, of the effect of nitric acid on certain rocks was continued during the entire year, as were also experiments on the effect of carbonic acid on Indiana limestone. This work was done by Mr. Steiger in cooperation with G. F. Loughlin. Mr. Steiger also made a series of experiments on the dehydration of gypsum, selenite, and alunogen. E. S. Larsen conducted a microscopic study of the minerals in their various degrees of hydration. These three studies require experimentation extending over long periods of time and will be continued during the coming year.

A method for the determination of sulphur in the form of sulphide in the presence of carbonates in water was devised by J. G. Fairchild, and details for its successful application to practical work were perfected and will shortly be published in the Journal of the American Chemical Society.

A number of analytical methods were tested during the year to determine whether they might profitably be applied to the work of the laboratory.

WORK IN PHYSICS.

The physical laboratory is in charge of C. E. Van Orstrand, physical geologist. Apart from minor investigations which were made for the immediate use of geologists, investigations in this laboratory were conducted on the diffusion of solids (in cooperation with F. P. Dewey, of the Treasury Department), deep earth temperatures, the construction of mathematical tables, and the determination of pore space in rocks.

The experiments on the diffusion of solids require a long time, and the studies have continued through several years. Observations of deep earth temperatures were made from time to time by Mr. Van Orstrand. It is planned to extend these observations to the principal oil fields in the United States, where the ardent search for new oil reserves is stimulating boring to much greater depths than heretofore, thus affording unprecedented opportunities for such observations. Reports of progress have been published by Mr. Van Orstrand, who is also continuing the preparation of his tables of the probability integral.

The examination of the composition of oil sands, the size and shapes of the grains, and the pore space has been carried on by A. F. Melcher, who visited oil fields in Texas, Kansas, and Wyoming for the field inspection of outcropping sands and the collection of samples from the productive zones penetrated by the drill. These investigations concern the rate of production and longevity of the sands, as

well as the problem of more complete ultimate extraction of the oil in the sands.

Considerable progress has been made in the computation of the exponential function by M. A. Shoultes, who also has assisted in all the experimental work of the physical laboratory.

REPORTS PUBLISHED OR IN PREPARATION.

In addition to the papers already mentioned, the following reports by members of the division have been published or are in course of preparation:

By F. W. Clarke, The data of geochemistry, 4th ed. (U. S. Geol. Survey Bull. 695); Report of the International Committee on Atomic Weights for 1919-20 (Am. Chem. Soc. Jour., December, 1919); Recalculation of atomic weights (Nat. Acad. Sci. Mem.); Inorganic constituents of marine invertebrates (revision and enlargement of U. S. Geol. Survey Prof. Paper 102). By George Steiger and E. S. Larsen, Griffithite, nontronite, and alumogen. By E. S. Larsen, J. T. Pardee, and George Steiger, Bementite (Am. Jour. Sci.). By R. C. Wells, Determination of carbon dioxide in sea water at Tortugas, Fla. (Carnegie Inst. Year Book 18); Studies of purchasing power; An unusual deposit of aragonite from sea water (Washington Acad. Sci. Jour., May 4, 1920); Zirconium sulphate of exact composition; Note on "brannerite" (Franklin Inst. Jour., June, 1920); Sodium and sodium compounds in 1918 (Mineral Resources); The salt error of cresol red. By R. C. Wells and F. L. Hess, Brannerite, a new uranium mineral (Franklin Inst. Jour., February, 1920). By J. G. Fairchild, Notes on mineral sulphide water analyses. By H. D. Miser and J. G. Fairchild, Hausmannite in the Batesville district, Ark. (Washington Acad. Sci. Jour., May, 1920). By J. S. Diller, J. G. Fairchild, and E. S. Larsen, High-grade talc for gas burners. By W. B. Hicks, Potash in 1918 (Mineral Resources); Potash resources of Nebraska (U. S. Geol. Survey Bull. 715-I); Refined potassium salts in 1918 (U. S. Geol. Survey Press Bulletin). By W. T. Schaller, reports on mica and on thorium and rare-earth minerals in 1918 (Mineral Resources). By E. T. Erickson, in cooperation with K. C. Heald, Tests to detect small quantities of oil and bitumen (U. S. Geol. Survey Press Bulletin). By C. E. Van Orstrand, Tables of the exponential function and of the circular sine and cosine to radian argument (Nat. Acad. Sci. Mem. 5, vol. 14, 1920); Deepest well in the world (U. S. Geol. Survey Press Bulletin, July, 1919); Deep earth temperatures of the globe. By A. F. Melcher, Determination of pore space in oil and gas sands (Am. Inst. Min. Met. Eng. Bull., April, 1920).

TOPOGRAPHIC BRANCH.

ORGANIZATION.

The organization of the topographic branch during the year was as follows:

Chief geographer, R. B. Marshall, to September 30, 1919; chief topographic engineer, C. H. Birdseye, since October 1, 1919.

Atlantic division, Frank Sutton, geographer, in charge.

Central division, W. H. Herron, geographer, in charge.

Rocky Mountain division, T. G. Gerdline, geographer, in charge.

Northwestern division, T. G. Gerdine and G. R. Davis, geographers, in charge.

Pacific division, G. R. Davis, geographer, in charge.

Computing section, E. M. Douglas, geographer, in charge.

Section of inspection and editing, W. M. Beaman, topographic engineer, in charge.

Section of cartography, A. F. Hassan, draftsman, in charge.

PERSONNEL.

During the fiscal year 25 members of the topographic branch who had held commissions in the Engineer Officers' Reserve Corps were reinstated in their former positions, including 14 topographic engineers, 2 topographers, and 9 assistant topographers; at the end of the year 17 others had not requested reinstatement from the Army. The technical force was also increased by transfers and reinstatements and was reduced by resignations and transfers. With these changes the corps now includes 1 chief topographic engineer, 9 geographers, 64 topographic engineers, 6 topographers, 40 assistant topographers, 25 junior topographers, 1 map editor, 1 map reviser, 1 computer, and 9 draftsmen—a total of 157. During the year 3 topographic engineers, 1 topographer, 2 assistant topographers, and 3 junior topographers were on furlough. Nine members of the permanent force were on furlough during the year for work in Haiti and Santo Domingo. In addition, 50 technical field assistants were employed during the whole or a part of the fiscal year. The clerical force comprises 13 clerks of various grades.

PUBLICATIONS.

The published work of the topographic branch for the fiscal year consists of 69 published maps; Bulletin 709-A, Triangulation and primary traverse in Maryland, Delaware, and West Virginia, 1916-1918; and Bulletin 709-B, Primary traverse in Florida, 1917. These publications are noticed on page 21. The manuscript for a revised edition of Bulletin 226, Boundaries of the United States, to be issued under a new number, was transmitted for publication.

APPROPRIATIONS.

The total appropriations for topographic surveys for the fiscal year 1920 were as follows:

Topographic surveys.....	\$325,000. 00
Statutory salaries.....	9,200. 00
Special funds for military mapping (contributed by War Department)	280,000. 00
	<hr/> 594,200. 00

COOPERATION.

Cooperation has been maintained in 21 States and 1 Territory, which contributed the following amounts:

Arizona.....	\$1, 620. 07
California.....	31, 354. 45
Colorado.....	327. 35
Hawaii.....	802. 61
Idaho.....	4, 562. 74
Illinois.....	19, 157. 17
Indiana.....	1, 323. 40
Iowa.....	1, 714. 63
Kentucky.....	12, 889. 26
Maine.....	2, 480. 94
Michigan.....	14, 297. 67
Mississippi.....	1, 819. 33
Missouri.....	4, 228. 28
New York.....	14, 949. 52
North Dakota.....	1, 499. 97
Pennsylvania.....	11, 046. 92
Texas.....	11, 168. 34
Vermont.....	2, 702. 04
Virginia.....	4, 714. 02
West Virginia.....	15, 088. 82
Washington.....	11, 577. 85
Wisconsin.....	21, 262. 39
	<hr/>
	190, 537. 77

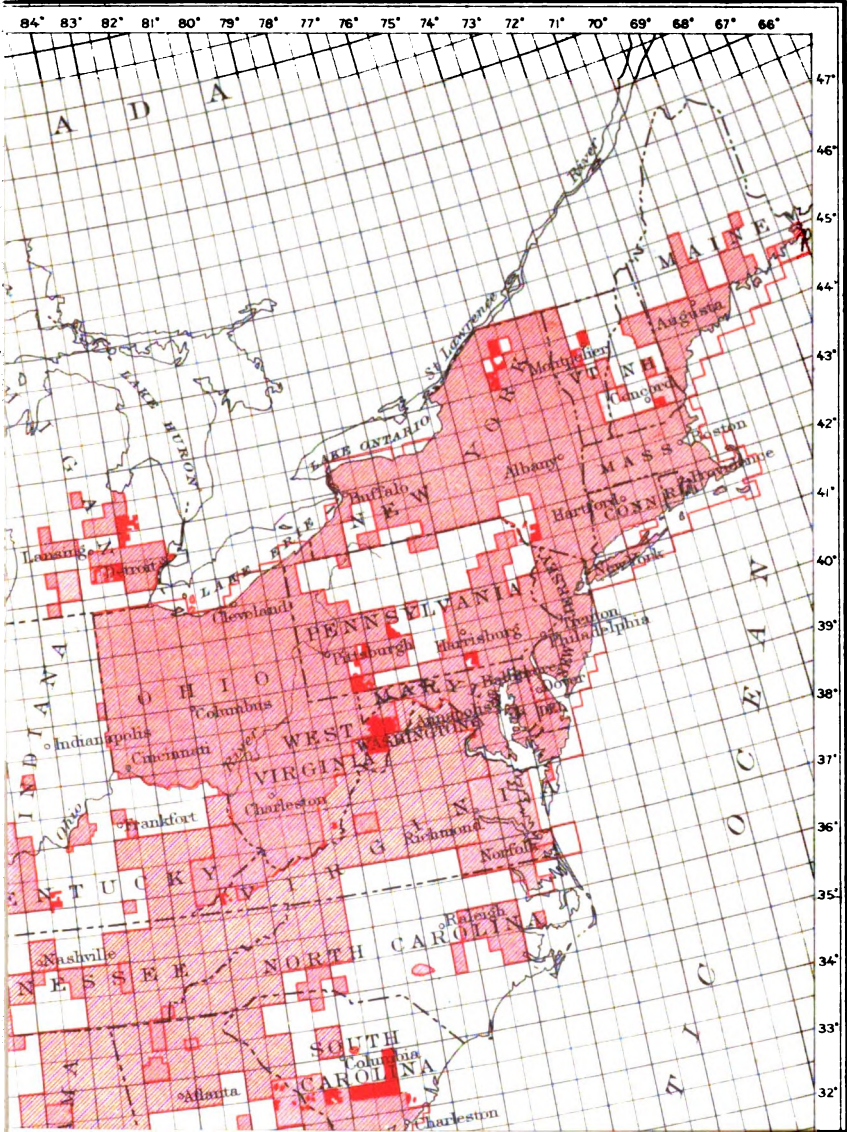
Of the State cooperative contributions reported in the Fortieth Annual Report (\$102,476.10), \$28,458.47 was not expended prior to July 1, 1919, and remained available for expenditures during the fiscal year ending June 30, 1920. This amount is included in the figures given above.

In addition, an allotment of \$2,500 was made by the Illinois State Department of Public Works and Buildings for work on the Illinois road map, and an allotment of \$2,500 by the National Park Service for mapping a part of the floor of the Yosemite National Park; neither of these was met by Survey funds. The Bureau of Public Roads allotted \$5,800, with the understanding that an equal amount would be expended from Survey funds after July 1, 1920, and six draftsmen, who were employed in compiling road maps, were detailed to that Bureau from March 1 to the end of the fiscal year.

SUMMARY OF RESULTS.

The condition of topographic surveys to June 30, 1920, distinguished as to scale, etc., is shown on Plate II.

As shown in the following table, the new area mapped was 11,178 square miles, making the total area surveyed to date in the United States 1,301,136 square miles, or 42.9 per cent of the entire country.



In addition, 1,214 square miles of resurvey was completed, making the total area of surveys during the year 12,392 square miles.

In connection with these surveys, 4,788 linear miles of primary levels were run, making 282,950 miles of primary and precise levels run since the authorization of this work by Congress in 1896. In the course of this work 1,242 permanent bench marks were established. In addition, 10 linear miles of river surveys were run.

Triangulation stations to the number of 161 were occupied and 170 were permanently marked. Primary traverse lines aggregating 3,628 miles were run, in connection with which 399 permanent marks were set.

Present condition of topographic surveys of the United States and new area surveyed July 1, 1919, to June 30, 1920.

State.	New area mapped July 1, 1919, to June 30, 1920.	Total area mapped to June 30, 1920.	Percentage of total area of State mapped to June 30, 1920.
	Sq. miles.	Sq. miles.	
Alabama.....		19,192	37.0
Arizona.....	100	70,236	62.0
Arkansas.....		21,494	40.3
California.....	1,532	124,880	78.8
Colorado.....	67	51,047	49.1
Connecticut.....		4,965	100.0
Delaware.....		2,370	100.0
District of Columbia.....		70	100.0
Florida.....		4,716	8.0
Georgia.....	162	24,835	41.9
Idaho.....	256	28,452	33.7
Illinois.....	694	17,601	31.0
Indiana.....		3,609	10.0
Iowa.....	129	12,045	21.4
Kansas.....		64,159	76.0
Kentucky.....	218	18,383	45.2
Louisiana.....		8,366	17.2
Maine.....		10,297	31.1
Maryland.....		12,327	100.0
Massachusetts.....		8,266	100.0
Michigan.....	861	10,219	17.6
Minnesota.....		7,354	9.0
Mississippi.....	74	2,200	4.6
Missouri.....		36,913	53.1
Montana.....	47	58,558	40.0
Nebraska.....		27,117	35.0
Nevada.....		51,141	46.2
New Hampshire.....	102	4,235	45.3
New Jersey.....		8,224	100.0
New Mexico.....		42,588	34.7
New York.....	678	45,341	92.1
North Carolina.....		18,876	36.0
North Dakota.....	87	9,901	14.0
Ohio.....		41,040	100.0
Oklahoma.....		39,908	57.0
Oregon.....	333	25,568	26.4
Pennsylvania.....	779	26,008	58.8
Rhode Island.....		1,248	100.0
South Carolina.....	1,849	13,675	44.1
South Dakota.....		19,032	25.0
Tennessee.....		21,283	50.6
Texas.....	1,615	74,999	28.1
Utah.....	6	69,031	82.0
Vermont.....	268	4,844	50.6
Virginia.....	69	35,819	84.0
Washington.....	563	31,027	44.8
West Virginia.....		24,170	100.0
Wisconsin.....	644	13,419	23.9
Wyoming.....	45	30,088	31.0
Total United States (exclusive of Alaska).....	11,178	1,301,136	42.9
Hawaii.....		1,393	

GENERAL OFFICE WORK.

Results of computations for vertical and horizontal control were copied and catalogued.

The computations of control data were made under the immediate supervision of E. M. Douglas, geographer. S. S. Gannett, geographer, was engaged in preparing manuscript and compiling data for bulletins submitted for publication and in miscellaneous computations.

J. H. Renshawe, geographer, was engaged during the year in preparing relief maps of parts of southern California, southwestern Arizona, the southern Appalachian region, the Grand Canyon National Park, and Alaska.

SECTION OF INSPECTION AND EDITING OF TOPOGRAPHIC MAPS.

The section of inspection in the topographic branch and the section of topographic-map editing in the publication branch were consolidated February 26, 1920, into the section of inspection and editing of topographic maps and placed under the administrative and technical control of the topographic branch. W. M. Beaman, previously in charge of the section of inspection, was designated topographic engineer in charge of the new section, which has general supervision of the office preparation, inspection, and editing of all topographic maps. The work of this section is described under "Publication branch" (pp. 162-163).

CARTOGRAPHY.

The compilation of the United States portion of the international map of the world, under the immediate supervision of A. F. Hassan, was resumed March 1, in order to complete, as early as possible, base maps on the scale of 1:500,000 for all the States. Prior to that date the cartographic force was engaged in inking the original military topographic maps and military information data and in finishing the Arizona portion of the international map, which was undertaken in cooperation with the State of Arizona the previous year. The force completed 30 topographic maps, 31 military-information tracings, and the base map of Arizona. The compilation of base maps was carried to the following percentages of completion: California, 45 per cent; Colorado, 65 per cent; Coastal Plain area of Texas, 85 per cent; Nebraska, 45 per cent; North Dakota, 95 per cent; South Dakota, 65 per cent. Maps of this series have been published for 35 States.

ATLANTIC DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Georgia, Maine, Mississippi, New Hampshire, New York, Penn-

sylvania, South Carolina, Vermont, Virginia, and West Virginia. This work comprised the completion of the survey of 18 quadrangles and 2 special areas and the resurvey of 5 quadrangles, in addition to which 12 quadrangles were partly surveyed and 3 were partly resurveyed. Primary triangulation and primary traverse were carried on by seven parties in Maine, Mississippi, New York, Pennsylvania, Virginia, and West Virginia.

Topographic surveys in Atlantic division from July 1, 1919, to June 30, 1920.

State.	Con- tour inter- val.	For publication on the scale of—				Total area sur- veyed.	Primary levels.		Primary traverse.		Triangula- tion.	
		1:62,500.		1:20,000 (new).	Dis- tance run.		Bench marks.	Dis- tance run.	Per- ma- nent marks.	Sta- tions occu- pied.	Sta- tions mark- ed.	
		New.	Resur- vey.									
	<i>Feet.</i>	<i>Sq. m.</i>	<i>Sq. m.</i>	<i>Sq. m.</i>	<i>Sq. m.</i>	<i>Miles.</i>		<i>Miles.</i>				
Georgia.....	10, 20	162			162	87	24				8	
Maine.....		74			74			158	32			
Mississippi.....	20	102			102							
New Hampshire.....	20	678			678	235	62	197	21			
New York.....	20	779			779	321	104	260	9			
Pennsylvania.....	10	1,849			1,849	129	31					
South Carolina.....	20	268			268	110	31					
Vermont.....	2, 10		23	69	92	194	45	229	21			
Virginia.....	50					367	110	36	11	18	14	
West Virginia.....	50		944		944							
		3,912	967	69	4,948	1,443	407	880	94	26	14	

Georgia.—In cooperation with the War Department, the survey of the Appling, Dearing, and Rocky Ford quadrangles, in Bulloch, Columbia, Jenkins, Lincoln, McDuffie, Richmond, Screven, and Wilkes counties, Ga., was completed, the total area mapped being 119 square miles, for publication on the scale of 1:62,500, with contour intervals of 10 and 20 feet.

Georgia-South Carolina.—In cooperation with the War Department, the survey of the Augusta quadrangle, in Burke and Richmond counties, Ga., and Aiken and Columbia counties, S. C., was completed, and that of the Warrenville quadrangle, in Richmond County, Ga., and Aiken County, S. C., was continued, the total area mapped being 155 square miles, 43 square miles in Georgia and 112 square miles in South Carolina, for publication on the scale of 1:62,500, with a contour interval of 20 feet.

Maine.—For the continuation of cooperative topographic surveys in Maine the State Water Power Commission allotted \$5,000 and the United States Geological Survey allotted an equal amount. For the control of the Farmington quadrangle 87 miles of primary levels were run and 24 permanent bench marks established, and for the control of the Brassua Lake and Moosehead quadrangles 8 triangulation stations were occupied.

Mississippi.—For beginning cooperative topographic surveys in Mississippi during the fiscal year 1920–21 the State Geological Survey allotted \$20,000 and the United States Geological Survey allotted an equal amount. In order that field work might be taken up immediately, this money was made available in the spring of 1920. For the control of the Doloroso, Forest, Morton, and Pelahatchie quadrangles 158 miles of primary traverse were run and 32 permanent marks set.

Mississippi-Louisiana.—In addition to the cooperative work the survey of the Natchez quadrangle, in Adams and Jefferson counties, Miss., and Catahoula County, La., was continued, the total area mapped being 74 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. All the area mapped was in the State of Mississippi.

New Hampshire.—In cooperation with the War Department the survey of the Suncook quadrangle, in Hillsboro, Merrimack, and Rockingham counties, N. H., was completed, the total area mapped being 102 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet.

New York.—For the continuation of cooperative topographic surveys in New York the State engineer and surveyor allotted \$15,000 and the United States Geological Survey allotted an equal amount. The survey of the Cranberry Lake and Nicholville quadrangles, in Franklin, Hamilton, Herkimer, and St. Lawrence counties, was completed, and that of the Childwold and White Lake quadrangles, in Franklin, St. Lawrence, and Sullivan counties, was begun, the total area mapped being 673 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of the Childwold, Nicholville, Livingston Manor, and White Lake quadrangles, 227 miles of primary levels were run and 60 permanent bench marks established, and for the control of the Livingston Manor and White Lake quadrangles 124 miles of primary traverse were run and 9 permanent marks set. (See also Pennsylvania-New York.)

Pennsylvania.—For the continuation of cooperative topographic surveys in Pennsylvania the State Topographic and Geologic Survey allotted \$25,000 and the United States Geological Survey allotted an equal amount. The survey of the Confluence and Meyersdale quadrangles, in Fayette and Somerset counties, was completed, and that of the Altoona, Hanover, New Florence, and Stahlstown quadrangles, in Adams, Blair, Cambria, Center, Clearfield, Fayette, Indiana, Somerset, Westmoreland, and York counties, was begun, the total area mapped being 730 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of the Altoona, Confluence, Hanover, New Florence, and Philipsburg quadrangles 254 miles of primary levels were run and 88 permanent bench

marks established, and for the control of these quadrangles and the Tyrone and Stahlstown quadrangles 173 miles of primary traverse were run and 8 permanent marks set.

Pennsylvania-New York.—The survey of the Damascus and Long Eddy quadrangles, in Pike and Wayne counties, Pa., and Delaware and Sullivan counties, N. Y., was begun, the total area mapped being 54 square miles (49 square miles in Pennsylvania and 5 square miles in New York), for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of these quadrangles 75 miles of primary levels were run, 18 permanent bench marks established, 160 miles of primary traverse run, and 18 permanent marks set.

South Carolina.—In cooperation with the War Department the survey of the Bamberg, Bowman, Chicora, Eutawville, Manning, Mayesville, and Orangeburg quadrangles, in Bamberg, Barnwell, Berkeley, Calhoun, Clarendon, Dorchester, Lee, Orangeburg, Sumter, and Williamsburg counties, S. C., was completed, and that of the Moncks Corner and Williston quadrangles, in Aiken, Barnwell, and Berkeley counties, was continued, the total area mapped being 1,737 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of these quadrangles 129 miles of primary levels were run and 31 permanent bench marks established.

Vermont.—For the continuation of cooperative topographic surveys in Vermont the State geologist allotted \$3,000 and the United States Geological Survey allotted an equal amount. The survey of the Lincoln Mountain and Montpelier quadrangles, in Addison, Chittenden, Lamoille, and Washington counties, was completed, the total area mapped being 268 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of the Montpelier, Bolton, and Hyde Park quadrangles 110 miles of primary levels were run and 31 permanent bench marks established.

Virginia.—In cooperation with the War Department the survey of Camp A. A. Humphreys, in Arlington and Fairfax counties, Va., was completed, the total area mapped being 57 square miles, for publication on the scale of 1:20,000, with a contour interval of 10 feet. For the control of this area 150 miles of primary levels were run, 36 permanent bench marks established, and 160 miles of primary traverse run.

In cooperation with the War Department the survey of the Big Bethel Reservoir, in Elizabeth City, Warwick, and York counties, was completed, the total area mapped being 12 square miles, for publication on the scale of 1:20,000, with a contour interval of 2 feet.

For the continuation of cooperative topographic surveys in Virginia the State geologist allotted \$2,544.10 and the United States Geological Survey allotted an equal amount. For the control of the Chatham quadrangle 69 miles of primary traverse were run and 21 permanent marks set.

Virginia-Kentucky.—In cooperation with the State of Virginia the resurvey of the Big Stone Gap quadrangle, in Lee, Scott, and Wise counties, Va., and Harlan County, Ky., was begun, the total area mapped being 23 square miles, for publication on the scale of 1:62,500, with a contour interval of 50 feet. The area mapped was all in Virginia. For the control of this quadrangle 44 miles of primary levels were run and 9 permanent bench marks established, all in Virginia.

West Virginia.—For the continuation of cooperative topographic surveys in West Virginia the State geologist allotted \$18,750 and the United States Geological Survey allotted an equal amount. The resurvey of the Davis, Elk Garden, Maysville, Onego, and Petersburg quadrangles, in Grant, Hardy, Mineral, Pendleton, and Randolph counties was completed, and that of the Moorefield quadrangle, in Hardy and Hampshire counties, was begun, the total area mapped being 929 square miles, for publication on the scale of 1:62,500, with a contour interval of 50 feet. For the control of the Keyser, Maysville, Moorefield, Onego, and Petersburg quadrangles 367 miles of primary levels were run and 110 permanent bench marks established, and for the control of the Elk Garden and Keyser quadrangles 36 miles of primary traverse were run and 11 permanent marks set. For the control of the Alderson, Clintonville, Lobelia, Richwood, Simonville, and White Sulphur Springs quadrangles 13 triangulation stations were occupied, 9 of which were permanently marked.

West Virginia-Virginia.—In cooperation with the State of West Virginia, the resurvey of the Ronceverte quadrangle, in Greenbrier and Monroe counties, W. Va., and Allegheny and Craig counties, Va., was begun, the total area mapped being 15 square miles, for publication on the scale of 1:62,500, with a contour interval of 50 feet. For the control of the Ronceverte and Pearisburg quadrangles five triangulation stations were occupied and marked.

OFFICE WORK.

The drafting of the following sheets was completed: Appling, Bascom, Brooklet, Cumberland Island, Dearing, Glennville, Hephzibah, Millen, Pembroke, Rocky Ford, Stapleton, Statesboro, Ga.; Augusta, Clarks Hill, Ellenton, Greens Cut, Peeples, Ga.-S. C.; Suncook, N. H.; Cranberry Lake, Nicholville, N. Y.; Camp Bragg, N. C.; Meyersdale, Pa.; Aiken, Bamberg, Bowman, Camp Jackson,

Lodge, Manning, Maysville, Orangeburg, Ridgeville, St. George, Summerville, S. C.; Memphis, Tenn.-Ark.; Lincoln Mountain, Montpelier, Vt.; Ivor, McKenney, Homeville, Lawrenceville, Wise, Va.; Arringdale, Boykins, Holland, White Plains, Va.-N. C.; Davis, Elk Garden, Greenland Gap, W. Va.

Progress in the drafting of additional sheets was made as follows: Warrenville, Ga.-S. C., 66 per cent; Childwold, N. Y., 10 per cent; Confluence, Pa., 53 per cent; Chicora, S. C., 20 per cent; Eutawville, S. C., 45 per cent; Talatha, S. C., 50 per cent; Williston, S. C., 65 per cent; Coeburn, Va., 53 per cent.

Primary-level circuits were adjusted for the following quadrangles: Camp Hancock, Hephzibah, Ga.; Allendale, Augusta, Clarks Hill, Greens Cut, Hilltonia, Peeples, Robbins, Shirley, Ga.-S. C.; Childwold, N. Y.; Confluence, Hanover, Meyersdale, Tobyhanna Military Reservation (Pocono quadrangle), Pa.; Bowman, Chicora, Manning, Moncks Corner, Rimini, S. C.; Bolton, Montpelier, Vt.; Coeburn, Camp A. A. Humphreys, Hampton, Va.; Maysville, Onego, Petersburg, W. Va.

Geographic positions were computed for the following quadrangles: Altamaha, Broxton, Dates, Leliaton, Lumber City, Macon, Meriwether, Perrys Mills, Stillmore, Wilcox, Ga.; Doloroso, Miss.; Alton, Gilmanton, Mount Pawtuckaway, Suncook, N. H.; Damascus, Livingston Manor, Long Eddy, White Lake, N. Y.; Accident, Altoona, Birmingham, Confluence, Damascus, Hanover, Long Eddy, New Florence, Stahlstown, Uniontown, Pa.; Bamberg, Batesburg, Bowman, Bonneau, Branchville, Chapin, Chicora, Edmund, Elloree, Eutawville, Fort Motte, Hopkins, Indiantown, Kingstree, Lexington, Manning, Orangeburg, Ridgeville, Rimini, St. George, Seivern, Summerville, Sumter, Woodford, S. C.; Barre, Bolton, Royaltown, Waitsfield, Vt.; Big Stone Gap, Camp A. A. Humphreys, Va.; Alderson, Callaghan, Clintonville, Elk Garden, Keyser, Lobelia, Maysville, Moorefield, Onego, Orkney Springs, Pearisburg, Petersburg, Richwood, Ronceverte, Simmonsville, White Sulphur Springs, W. Va.

CENTRAL DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Illinois, Indiana, Iowa, Kentucky, Michigan, Missouri, and Wisconsin. The work comprised the completion of the survey of 9 quadrangles and the resurvey of 2, in addition to which 12 quadrangles were partly surveyed. Primary traverse was carried on by seven parties in Illinois, Indiana, Kentucky, Michigan, and Wisconsin.

Topographic surveys in central division from July 1, 1919, to June 30, 1920.

State.	Con- tour inter- val.	For publication on scale of 1:62,500.		Total area sur- veyed.	Primary levels.		Primary traverse.	
		New.	Re- survey.		Dis- tance run.	Bench marks.	Dis- tance run.	Perma- nent marks.
	<i>Feet.</i>	<i>Sq. mi.</i>	<i>Sq. mi.</i>	<i>Sq. mi.</i>	<i>Miles.</i>		<i>Miles.</i>	
Illinois.....	10, 20	694		694	323	91	379	32
Indiana.....							225	18
Iowa.....	10	129		129	67	17		
Kentucky.....	20	218		218	202	56	281	45
Michigan.....	5, 10	861		861	301	59	768	60
Missouri.....	10		247	247	65	23		
Wisconsin.....	20	644		644	514	142	737	73
	.....	2,546	247	2,793	1,477	388	2,390	228

Illinois.—For the continuation of cooperative topographic surveys in Illinois the Department of Registration and Education allotted \$15,394.49 and the United States Geological Survey allotted an equal amount. The survey of the Barrington and Vermont quadrangles, in Cook, Fulton, Kane, Lake, and McHenry counties, was completed, and that of the Carbondale and Dongola quadrangles, in Jackson, Johnson, Pulaski, Union, and Williamson counties, was begun, the total area mapped being 528 square miles, for publication on the scale of 1:62,500, with contour intervals of 10 and 20 feet. For the control of the Barrington, Carbondale, Dongola, Joliet, and Mound City quadrangles 252 miles of primary levels were run and 71 permanent bench marks established, and for the control of the Annawan, Alexis, Barry, Buda, Camp Grove, Carbondale, Galesburg, Hannibal, Joliet, Liberty, Marion, Marshall, Mendon, Merom, Moonshine, Monmouth, Mount Sterling, Oilfield, Oquawka, Quincy, and Yorkville quadrangles 379 miles of primary traverse were run and 32 permanent marks set.

Illinois-Wisconsin.—In cooperation with the State of Illinois the survey of the Grays Lake quadrangle, in Lake and McHenry counties, Ill., and Kenosha County, Wis., was begun, the total area mapped being 166 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of this area 76 miles of primary levels were run and 20 permanent bench marks established.

Indiana.—For cooperative topographic surveys in Indiana the State geologist allotted \$1,323.40 and the United States Geological Survey allotted an equal amount. For the control of the Heltonville and Oolitic quadrangles 225 miles of primary traverse were run and 18 permanent marks set.

Iowa.—For the continuation of cooperative topographic surveys in Iowa the State Geological Survey allotted \$1,750 and the United

States Geological Survey allotted an equal amount. The survey of the Lehigh quadrangle, in Webster County, was begun, the total area mapped being 129 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of the Lehigh and Dakota quadrangles 67 miles of primary levels were run and 17 permanent bench marks established.

Kentucky.—For the continuation of cooperative topographic surveys in Kentucky the Commissioner of Geology and Forestry allotted \$12,943.60 and the United States Geological Survey allotted an equal amount. The survey of the Alvaton and Glenmore quadrangles, in Allen, Butler, Edmonson, Simpson, and Warren counties, was begun, the total area mapped being 172 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of these quadrangles 202 miles of primary levels were run and 56 permanent bench marks established, and for the control of these areas and the Bethpage, Lucas, Mammoth Cave, Salmons, and Temple Hill quadrangles 222 miles of primary traverse were run and 35 permanent marks set.

Kentucky-Illinois.—The survey of the Golconda quadrangle, in Livingston and Crittenden counties, Ky., and Pope and Hardin counties, Ill., was completed, the total area mapped being 46 square miles (all in Kentucky), for publication on the scale of 1:62,500, with a contour interval of 20 feet.

Kentucky-Tennessee.—For the control of the Adolphus and Buck Lodge quadrangles 59 miles of primary traverse were run and 10 permanent marks set.

Michigan.—For the continuation of cooperative topographic surveys in Michigan the State geologist allotted \$14,370 and the United States Geological Survey allotted an equal amount. The survey of the Burt, Rives Junction, Springport, and Stockbridge quadrangles, in Calhoun, Eaton, Genesee, Ingham, Jackson, Livingston, Saginaw, Shiawassee, and Washtenaw counties, was completed, and that of the Durand and Flint quadrangles, in Genesee, Livingston, Saginaw, Shiawassee, and Tuscola counties, was begun, the total area mapped being 861 square miles, for publication on the scale of 1:62,500, with contour intervals of 5 and 10 feet. For the control of the Burt, Durand, Flint, and Holly quadrangles 301 miles of primary levels were run and 59 permanent bench marks established. For the control of the Armada, Avoca, Berkshire, Butman, Crosswell, Forestville, Freeland, Hicky, Highwood, Marlette, Mayville, Melvin, Sanford, Shepherd, and Vassar quadrangles 768 miles of primary traverse were run and 60 permanent marks set.

In addition to the cooperative mapping done in Michigan a survey comprising 16 square miles along Flint River was made for the city engineer of Saginaw, in connection with the flood problems of the

Saginaw River basin. For the control of this area 80 miles of primary levels were run and 15 permanent bench marks established.

Missouri.—For the continuation of cooperative topographic surveys in Missouri the State geologist allotted \$5,000 and the United States Geological Survey allotted an equal amount. The resurvey of the Sarcoxie and Stotts City quadrangles, in Jasper and Lawrence counties, was completed, the total area mapped being 247 square miles, for publication on the scale of 1:62,500, with a contour interval of 10 feet. For the control of the Braymer, Dearborn, Gower, Gallatin, Plattsburg, Polo, and Winston quadrangles 65 miles of primary levels were run and 23 permanent bench marks established.

Wisconsin.—For the continuation of cooperative topographic surveys in Wisconsin the State geologist allotted \$15,000 and the United States Geological Survey allotted an equal amount. The survey of the Kendall and Mauston quadrangles, in Juneau and Monroe counties, was completed, and that of the Mazomanie, Monroe, New Glarus, and Upson quadrangles, in Dane, Green, Iowa, Iron, and Sauk counties, was begun, the total area mapped being 644 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of the Upson, Mellen, Browntown, Monroe, Brodhead, New Glarus, Bibon, Superior, Rockmont, Brule, Iron Ore River, Cusson, Blanchardville, and Birch Lake quadrangles 514 miles of primary levels were run and 142 permanent bench marks established, and for the control of the Upson, Mellen, Three Lakes, New Glarus, Bibon, Birch Lake, Ashland, Moquah, Morse, Monico, Elcho, Antigo, Eland, Caroline, Hortonville, Appleton, Suamico, and Robbins quadrangles 737 miles of primary traverse were run and 73 permanent marks set.

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OFFICE WORK.

The drafting of the following sheets was completed: Vermont, Ill.; Burt, Rives Junction, Springport, Stockbridge, Mich.; Sarcoxie, Stotts City, Mo.; Kendall, Mauston, Wis.

Progress in the drafting of additional sheets was made as follows: Barrington, Ill., 60 per cent; Dongola, Ill., 36 per cent; Grays Lake, Ill.-Wis., 24 per cent; Lehigh, Iowa, 50 per cent; Glenmore, Ky., 8 per cent; Durand, Mich., 25 per cent; Flint, Mich., 50 per cent; Mazomanie, Wis., 52 per cent; Monroe, Wis., 15 per cent; New Glarus, Wis., 15 per cent; Upson, Wis., 35 per cent.

Primary-level circuits were adjusted for the following quadrangles: Barrington, Dongola, Joliet, Ill.; Grays Lake, Ill.-Wis.; Dakota, Lehigh, Iowa; Alvaton, Glenmore, Ky.; Burt, Durand, Flint, Holly, Imlay City, Lapeer, Schoolcraft, Mich.; Ashland, Bibon, Birch Lake, Blanchardville, Brodhead, Browntown, Brule, Ironwood, Kendall, Mellen, Monroe, New Glarus, Rockmont, Tomah, Upson, Wis.

Geographic positions were computed for the following quadrangles: Buda, Barrington, Desplaines, Elgin, Highwood, Joliet, Liberty, Marshall, McHenry, Merom, Moonshine, Oilfield, Quincy, Yorkville, Ill.; Grays Lake, Ill.-Wis.; Heltonville, Oolitic, Ind.; Dakota, Lehigh, Iowa; Alvaton, Glenmore, Lucas, Mammoth Cave, Salmons, Temple Hill, Ky.; Adolphus, Bethpage, Buck Lodge, Ky.-Tenn.; Alger, Algonac, Almont, Armada, Avoca, Bay City, Burt, Beaver Lake, Berkshire, Butman, Cass City, Crosswell, Durand, Flint, Forestville, Freeland, Hicky, Highwood, Holly, Imlay City, Ithaca, Lapeer, Loomis, Marlette, Mayville, Melvin, Merrill, Mount Clemens, Mount Forest, Nolan, Port Huron, Saginaw, St. Charles, Sanford, Sebewaing, Seymour Lake, Shepherd, Tyre, Vassar, Mich.; Antigo, Appleton, Ashland, Bibon, Birch Lake, Blanchardville, Browntown, Caroline, Clam Lake, Cross Plains, Eland, Elcho, Hortonville, Iron Ore River, Ironwood, Mellen, Monico, Monroe, Moquah, Morse, New Glarus, Odanah, Port Wing, Robbins, Seymour, State Line, Suamico, Three Lakes, Upson, Wis.

ROCKY MOUNTAIN DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Colorado, North Dakota, Texas, and Wyoming. The work comprised the completion of the survey of six quadrangles and one special area, in addition to which four quadrangles and one special area were partly surveyed. Primary triangulation and primary traverse were carried on by six parties in Colorado and Texas.

Topographic surveys in Rocky Mountain division from July 1, 1919, to June 30, 1920.

State.	Con- tour inter- val.	For publication on the scale of—				Total area sur- veyed.	Primary levels.		Primary traverse.		Triangula- tion.	
		1:12,000	1:31,680	1:62,500	1:125,000		Dis- tance run.	Bench marks.	Dis- tance run.	Per- ma- nent marks.	Sta- tions occu- pied.	Sta- tions mark- ed.
Colorado.	Feet.	Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.	Miles.		Miles.			
North	20, 100	2				65	125	34			10	8
Dakota	20			87		87	22	5				
Texas....	{ 5, 25, 50 }		89	1,526		1,615	1,078	296	203	50	92	104
Wyoming	100				45	45						
	.....	2	89	1,613	110	1,814	1,225	335	203	50	102	112

Colorado.—The mapping of the Kerber Creek mining district, in Saguache County, Colo., was begun, the total area mapped being 2 square miles, for publication on the scale of 1:12,000, with a contour

interval of 20 feet. This work was done in cooperation with the State geologist of Colorado, who allotted \$1,000, the United States Geological Survey furnishing the services of an experienced topographic engineer and the necessary instruments.

In addition to this cooperative mapping the survey of the Conejos quadrangle, in Alamosa, Conejos, and Rio Grande counties, was begun, the total area mapped being 65 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. For the control of this area 125 miles of primary levels were run and 34 permanent bench marks established, and 10 triangulation stations were occupied, 8 of which were marked.

North Dakota.—For beginning cooperative topographic surveys in North Dakota the State Geological Survey allotted \$1,500 and the United States Geological Survey allotted an equal amount. The survey of the Garrison quadrangle, in McLean County, was begun, the total area mapped being 87 square miles, for publication on the scale of 1:62,500, with a contour interval of 20 feet. For the control of this area 22 miles of primary levels were run and 5 permanent bench marks established.

Texas.—In cooperation with the War Department the survey of the Marathon, Monument Spring, Salt Lakes, and Tarida Ranch quadrangles, in Cameron, Hidalgo, Brewster, and Willacy counties, Tex., was completed, and that of the Marathon No. 1 quadrangle, in Brewster County, was begun, the total area mapped being 1,136 square miles, for publication on the scale of 1:62,500, with contour intervals of 5 and 50 feet. For the control of these areas and that of the Alice No. 1, Alice No. 3, Big Spring, Fort Stockton Nos. 1, 2, 3, and 4, Free No. 3, Hebbronville, Katherine No. 2, Loma Chata Nos. 3 and 4, Marathon No. 2, Midkiff, Pato Nos. 3 and 4, Rankin, Robstown, Sanderson Nos. 2 and 3, San Ygnacio, and Stiles quadrangles 826 miles of primary levels were run and 226 permanent bench marks established, and for the control of the Katherine Nos. 1 and 2, Padre Island No. 3, Salt Lakes, and Tarida Ranch quadrangles 203 miles of primary traverse were run and 50 permanent marks set. For the control of the Alice Nos. 1, 3, and 4, Fort Stockton Nos. 1, 2, 3, and 4, Free Nos. 1, 2, 3, and 4, Loma Chata Nos. 1 and 4, Marathon, Marathon Nos. 1 and 2, Monument Spring, Pato No. 3, Sanderson Nos. 1, 2, 3, and 4, and Stiles quadrangles 64 triangulation stations were occupied and 83 marked.

For the continuation of cooperative topographic surveys in Texas the Bureau of Economic Geology and Technology allotted \$9,455, to be used in the survey of the Sawyer Nos. 1, 2, 3, and 4 quadrangles, the United States Geological Survey giving credit to the State for cooperation on the Marathon, Monument Spring, Salt Lakes, and Tarida Ranch quadrangles, which were mapped in cooperation with the War

Department. The survey of the Sawyer No. 4 quadrangle, in Crockett, Iron, and Reagan counties, was completed and that of Sawyer No. 3 quadrangle, in Crockett and Reagan counties, was begun, the total area mapped being 390 square miles, for publication on the scale of 1:62,500, with a contour interval of 25 feet. For the control of these areas and the Sawyer Nos. 1 and 2 quadrangles 184 miles of primary levels were run, 45 permanent bench marks established, and 28 triangulation stations occupied, 21 of which were marked.

The State Board of Water Engineers allotted \$4,000 and the United States Geological Survey allotted an equal amount. The survey of the San Saba project, in San Saba County, was completed, the total area mapped being 89 square miles, for publication on the scale of 1:31,680, with a contour interval of 5 feet. For the control of this area 68 miles of primary levels were run and 25 permanent bench marks established.

Wyoming.—The survey of the Afton quadrangle, in Lincoln County, Wyo., was completed, the total area mapped being 45 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet.

OFFICE WORK.

The drafting of the following sheets was completed: Marathon, Monument Spring, Salt Lakes, Tarida Ranch, Tex.; Afton, Wyo.

Progress in the drafting of additional sheets was made as follows: Garrison, N. Dak., 5 per cent.

Primary-level circuits were adjusted for the following quadrangles: Big Spring, Crane, Fort Stockton Nos. 1, 2, 3, and 4, Free No. 3, Garden City, Katherine No. 4, Marathon Nos. 1, 2, and 3, Midkiff, Ozona, Salt Lakes, Sanderson Nos. 1 and 2, Sawyer No. 3, Stiles, Tex.

Geographic positions were computed for the following quadrangles: Animas Peak, Antelope, Avis, Big Hatchet Peak, Cienega Springs, Dog Mountains, Hachita, Hermanas, Hope, Orange, Playas, Pratt, Queen, Victorio, Walnut Wells, N. Mex.; Crane, Dove Mountain, Fort Stockton, Free, Hood Springs, Longfellow, Marathon, Sanderson, Santiago Peak, Sawyer No. 3, Stiles, Tex.; Como Ridge, Difficulty, Hanna, Leo, Saddleback Hills, Wyo.

NORTHWESTERN DIVISION.

FIELD WORK.

Summary.—During the year topographic mapping was carried on in Idaho, Montana, Oregon, and Washington. The work included the completion of the survey of five quadrangles, in addition to which six were partly surveyed. In addition, a profile survey was made of a portion of one river, the distance traversed being 10 linear miles.

Primary triangulation and primary traverse were carried on by two parties in Idaho and Washington.

Topographic surveys in northwestern division from July 1, 1919, to June 30, 1920.

State.	Con- tour inter- val.	For publication on scale of—		Total area sur- veyed.	Primary levels.		Primary traverse.		Triangulation.	
		1:62,500	1:125,000		Dis- tance run.	Bench marks.	Dis- tance run.	Per- ma- nent marks.	Sta- tions occu- pied.	Sta- tions marked.
	<i>Feet.</i>	<i>Sq. mi.</i>	<i>Sq. mi.</i>	<i>Sq. mi.</i>	<i>Miles.</i>		<i>Miles.</i>			
Idaho.....	50, 100	111	145	256	53	14			20	11
Montana.....	100		47	47						
Oregon.....	25, 50	333		333	143	27				
Washington.....	50, 100		563	563	126	18	136	22		
	.....	444	755	1,199	322	59	136	22	20	11

Idaho.—For the continuation of cooperative topographic surveys in Idaho the Bureau of Mines and Geology allotted \$1,190 and the United States Geological Survey allotted an equal amount. The survey of the Seven Devils quadrangle, in Adams County, was begun, the total area mapped being 111 square miles, for publication on the scale of 1:62,500, with a contour interval of 50 feet. For the control of this area 53 miles of primary levels were run and 14 permanent bench marks established, and for the control of the Avery, Bovill, Fernwood, Kendrick, and Washington Creek quadrangles 20 triangulation stations were occupied, 11 of which were marked.

In addition to the cooperative topographic mapping in Idaho, the survey of the Custer quadrangle, in Custer County, was completed, the total area mapped being 145 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet.

Montana.—The mapping of the Drummond 30-minute quadrangle, in Granite, Missoula, and Powell counties, Mont., was completed, the total area mapped being 47 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet.

Oregon.—In cooperation with the War Department, the survey of the Cottage Grove and Waldport quadrangles, in Lane and Lincoln counties, Oreg., was completed and that of the Alsea No. 3, Reedsport, and Scottsburg No. 2 quadrangles, in Douglas and Lane counties, was begun, the total area mapped being 333 square miles, for publication on the scale of 1:62,500, with contour intervals of 25 and 50 feet. For the control of the Alsea Nos. 2 and 3, Scottsburg Nos. 1, 3, and 4, and Waldport quadrangles 143 miles of primary levels were run and 27 permanent bench marks established.

Washington.—For the continuation of cooperative topographic surveys in Washington the State Board of Geological Survey allotted

\$10,500 and the United States Geological Survey allotted an equal amount. The survey of the Walla Walla quadrangle, in Columbia and Walla Walla counties, was completed, and that of the Sultan and Trinidad quadrangles, in Douglas, King, Kittitas, and Snohomish counties, was begun, the total area mapped being 563 square miles, for publication on the scale of 1:125,000, with contour intervals of 50 and 100 feet. For the control of the Sultan quadrangle 126 miles of primary levels were run, 18 permanent bench marks established, 136 miles of primary traverse run, and 22 permanent bench marks set.

A plan and profile survey of a portion of Nooksack River was made, the distance traversed being 10 linear miles, for publication on the scale of 1:31,680, with contour intervals of 5 and 25 feet.

OFFICE WORK.

The drafting of the following sheets was completed: Custer, Idaho; Drummond, Mont.; Cottage Grove, Waldport, Oreg.; Pysht, Walla Walla, Wickersham, Wash.

Progress in the drafting of additional sheets was made as follows: Seven Devils, Idaho, 48 per cent; Alsea No. 3, Oreg., 40 per cent; Lake Crescent, Wash., 90 per cent; Sultan, Wash., 33 per cent; Trinidad, Wash., 40 per cent.

Primary-level circuits were adjusted for the following quadrangles: Seven Devils, Idaho; Sultan, Wash.

Geographic positions were computed for the following quadrangles: Bovill, Kendrick, Seven Devils, Washington Creek, Idaho; Sultan, Wash.

PACIFIC DIVISION.

FIELD WORK.

Summary.—During the season topographic mapping was carried on in Arizona, California, and Utah. The work included the completion of the survey of 14 quadrangles and 2 special areas, in addition to which 8 quadrangles and 1 special area were partly surveyed. Primary triangulation and primary traverse were carried on by two parties in California.

Topographic surveys in Pacific division from July 1, 1919, to June 30, 1920.

State.	Con- tour inter- val.	For publication on the scale of—						
		1:4,800	1:12,000	1:21,120	1:24,000	1:31,680	1:62,500	1:125,000
		Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.	Sq. mi.
Arizona.....	Feet. 5, 10		11		25	64		
California.....	{ 2, 4, 5 50, 100 }	3				828	198	503
Utah.....	50			6				
		3	11	6	25	892	198	503

Topographic surveys in Pacific division from July 1, 1919, to June 30, 1920—Con.

State.	Total area sur- veyed.	Primary levels.		Primary traverse.		Triangulation.	
		Distance run.	Bench marks.	Distance run.	Perma- nent marks.	Stations occupied.	Stations marked.
	<i>Sq. mi.</i>	<i>Miles.</i>		<i>Miles.</i>			
Arizona.....	100						
California.....	1,532	321	53	19	5	13	33
Utah.....	6						
	1,638	321	53	19	5	13	33

Arizona.—The United States Reclamation Service, in cooperation with the State of Arizona, allotted \$4,000 and the United States Geological Survey allotted an equal amount for special surveys and investigations in Arizona to ascertain the feasibility of the storage and diversion of the waters of Gila River below San Carlos and the irrigation of lands in the proposed San Carlos project; the storage and diversion of waters of Gila and San Francisco rivers in the vicinity of Red Rock and Alma, N. Mex., and irrigation of lands therefrom in the State of Arizona. For this purpose 100 square miles of topographic mapping was completed, for publication on the scales of 1:12,000, 1:24,000, and 1:31,680, with contour intervals of 5 and 10 feet.

California.—In cooperation with the War Department the survey of the Nipomo quadrangle, in San Luis Obispo County, Calif., was completed and that of the Avenal and La Panza quadrangles, in San Luis Obispo and Santa Barbara counties, was begun, the total area mapped being 198 square miles, for publication on the scale of 1:62,500, with a contour interval of 50 feet.

For the continuation of cooperative topographic surveys in California the State Department of Engineering allotted \$14,000 for work in San Joaquin Valley and the United States Geological Survey allotted an equal amount. In addition to this, the State allotted \$7,500, which was not met by Survey funds. The survey of the Academy, Bridge, Carrisalito Springs, Charleston School, Dos Palos, Friant, Gregg, Kentucky Well, Madera, No. 18, Oxalis, Pozo Farm, and Sheep Ranch quadrangles, in Fresno, Madera, and Merced counties, was completed and that of the Kings River, Laguna Seca Ranch, No. 22 and No. 23 quadrangles, in Fresno and Merced counties, was begun, the total area mapped being 828 square miles, for publication on the scale of 1:31,680, with a contour intervals of 5 feet. For the control of the Academy, Arburnas, Carrisalito Springs, Charleston School, Clovis, Friant, Kings River, Laguna Seca Ranch, Malaga, No. 21, No. 22, No. 27, Reedley special, Sanger, Selma, Squaw Valley,

Sultana, and Wahtoke quadrangles 303 miles of primary levels were run and 48 permanent bench marks established, and for the control of the Arburnas, Carrisalito Springs, Chaney Ranch, Charleston School, Cierva Hills, Helm, Kerman, Monocline Ridge, No. 23, No. 24, No. 25, No. 26, No. 28, No. 29, No. 31, No. 32, Oil City, Ora, San Joaquin, Tranquillity, Tumey Hills, and Wheatville quadrangles 13 triangulation stations were occupied and 33 marked.

In addition to the cooperative topographic mapping, the survey of the Hinkley and Trimmer quadrangles, in Fresno and San Bernardino counties, was begun, the total area mapped being 503 square miles, for publication on the scale of 1:125,000, with a contour interval of 100 feet. Corrections in the field were made on the Preston Peak, Sawyers Bar, and Seiad quadrangles.

The survey of the floor of the Yosemite Valley was begun for the National Park Service, the total area mapped being 3 square miles, for publication on the scale of 1:4,800, with contour intervals of 2 and 4 feet. For the control of this area 18 miles of primary levels were run and 5 permanent bench marks established, 19 miles of primary traverse run, and 5 permanent marks set.

Hawaii.—For cooperative topographic surveys in the Territory of Hawaii the Governor of Hawaii allotted \$25,000 and the United States Geological Survey allotted an equal amount. No topographic mapping was accomplished under this agreement, as A. O. Burkland, topographic engineer, who has been placed in immediate charge of this work, did not sail for Hawaii until the middle of June.

Utah.—The survey of the Cottonwood special extended area, in Utah County, Utah, was completed, the total area mapped being 6 square miles, for publication on the scale of 1:21,120, with a contour interval of 50 feet. In addition to this work, plan and profile surveys and a survey of reservoir sites and canals in Salt Lake County, for drainage for Mill Creek and Cottonwood Creek in Utah, were begun, 22 square miles of topographic mapping being completed.

OFFICE WORK.

The drafting of the following topographic maps was completed: Oatman special, Ariz.; Bonanza, Bonita Ranch, Bridge, Carbona, Carrisalito Springs, Charleston School, Dos Palos, Daulton, Friant, Gregg, Gilroy Hot Springs, Gonzales, Kentucky Well, Madera, Metz, Nipomo, Oxalis, Pozo, Pozo Farm, Yosemite Valley, Volta, Calif.; Cottonwood special extended, Utah.

Progress in the drafting of additional sheets was made as follows: Hollister, Calif., 95 per cent; Los Banos, Calif., 90 per cent; Mount Boardman, Calif., 45 per cent; Santa Rita Bridge, Calif., 90 per cent; Trimmer, Calif., 81 per cent.

Primary-level circuits were adjusted for the following quadrangles: Yosemite and thirty-four 7½-minute quadrangles in San Joaquin Valley, Calif.

Geographic positions were computed for the following quadrangles: Oatman special, Ariz.; Avenal, Bonanza, Carrisalito Springs, Center School, La Panza, Nipomo, Ortigalito, Panoche, Pozo, Tumey Hills, and Yosemite National Park (Muir Woods extension) (boundary and area computations), survey of boundaries of additions to Muir Woods National Monument, Calif.; Rochester special, Nev.

WATER-RESOURCES BRANCH.

ORGANIZATION.

The work of the water-resources branch is conducted under the supervision of N. C. Grover, chief hydraulic engineer, and is organized in five divisions:

- Division of surface water, John C. Hoyt, hydraulic engineer, in charge.
- Division of ground water, O. E. Meinzer, geologist, in charge.
- Division of quality of water, W. D. Collins, chemist, in charge.
- Division of power resources, A. H. Horton, hydraulic engineer, in charge.
- Division of enlarged and stock-raising homesteads, H. C. Cloudman, classifier, in charge.

PERSONNEL.

During the year the technical force was reduced 54 by resignations, death, or transfers, and was increased 52 through reinstatements of men from military service and new appointments—a net reduction of 2. At the end of the year the force consisted of 1 chief hydraulic engineer, 19 hydraulic engineers, 25 engineers, 25 assistant engineers, 13 junior engineers, 2 geologists, 4 associate geologists, 3 junior chemists, 4 classifiers, 14 assistant classifiers, and 6 junior classifiers, a total of 116. Of this number, 1 hydraulic engineer and 3 assistant engineers are on furlough, and 1 hydraulic engineer, 13 engineers, 2 assistant engineers, 2 junior engineers, 1 classifier, and 1 assistant classifier are employed occasionally.

In the clerical force there were 10 separations and 16 accessions, and at the end of the year the force numbered 38.

ALLOTMENTS.

The appropriation for gaging streams was \$175,000. The cooperative funds made available by State allotments, amounting to \$173,380, have been increased in some States and decreased in others, making necessary corresponding adjustments of this work.

The appropriation for examination of lands under the stock-raising homestead law enacted December 29, 1916, was \$175,000.

Allotments of appropriations, water-resources branch.

For gaging streams:

General administration.....	\$17, 741. 33
Land-classification board.....	7, 000. 00
Map editing.....	288. 17
Branch administration.....	6, 500. 00
Computations.....	12, 000. 00
Reviewing manuscripts.....	1, 915. 00
Inspection.....	1, 000. 00
	<hr/> \$46, 444. 50

Surface water:

New England:

Connecticut.....	\$1, 600. 00
Maine.....	850. 00
New Hampshire.....	1, 000. 00
Vermont.....	900. 00
Massachusetts.....	2, 125. 00

6, 475. 00

New York.....	4, 975. 00
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Pennsylvania.....	645. 33
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Middle Atlantic States.....	800. 00
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South Atlantic States.....	5, 975. 00
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Tennessee.....	1, 890. 00
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Texas.....	4, 875. 00
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Upper Mississippi River:

Wisconsin.....	\$3, 375. 00
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Minnesota.....	300. 00
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Iowa.....	1, 700. 00
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Illinois.....	1, 500. 00
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6, 875. 00

Colorado, Wyoming, and New Mex-

ico.....	7, 875. 00
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Montana.....	\$4, 625. 00
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North Dakota.....	300. 00
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4, 925. 00

Great Basin:

Utah.....	\$4, 875. 00
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Nevada.....	2, 500. 00
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7, 375. 00

Idaho:

Outside of Snake

River basin.....	\$3, 875. 00
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Snow River basin.....	1, 000. 00
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4, 875. 00

Oregon.....	4, 875. 00
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Washington.....	4, 875. 00
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California.....	4, 975. 00
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Hawaii:

At Honolulu.....	\$4, 000. 00
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At Washington.....	800. 00
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4, 800. 00

Kansas.....	3, 500. 00
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Arizona.....	3, 000. 00
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83, 085. 33

For gaging streams—Continued.

Ground water:

General	\$16,600.00
Coastal Plain.....	1,400.00
	<hr/> \$18,000.00
Quality of water.....	7,850.00
Power resources	14,000.00
General supplies.....	600.00
Contingent	5,020.17
	<hr/> <hr/> 175,000.00

For enlarged and stock-raising homesteads:

Field work	\$89,495.00
Land-classification board	56,500.00
General administration.....	14,844.00
Branch administration	8,000.00
Contingent	6,161.00
	<hr/> 175,000.00

Of the total appropriations, 80 per cent was allotted for work in public-land States.

COOPERATION.

State.—The following amounts were expended by several States from cooperative allotments:

Alabama	\$175
Arizona	2,985
California:	
State engineer.....	\$11,355
State Water Commission.....	9,395
City of San Francisco.....	2,335
San Bernardino, Riverside, and Orange counties	3,000
	<hr/> 26,085
Colorado	500
Connecticut.....	1,005
Georgia.....	535
Hawaii	26,200
Idaho:	
Outside of Snake River basin.....	\$9,685
Snake River basin.....	1,470
	<hr/> 11,155
Illinois	3,620
Iowa:	
State Geological Survey.....	\$655
State Highway Commission.....	2,340
	<hr/> 2,995
Kansas.....	4,010
Kentucky.....	250
Maine.....	4,290
Massachusetts.....	2,450
Minnesota.....	610
Montana.....	3,425

Nevada.....	\$2, 510
New Hampshire.....	1, 560
New York:	
State engineer	\$2, 500
Conservation Commission.....	9, 995
	<hr/> 12, 495
North Carolina.....	415
North Dakota.....	575
Oregon.....	5, 700
Pennsylvania.....	25, 780
South Dakota.....	180
Tennessee.....	490
Texas.....	10, 280
Utah.....	4, 735
Vermont.....	1, 060
Washington.....	6, 190
West Virginia.....	355
Wisconsin.....	6, 245
Wyoming.....	4, 520
	<hr/> 173, 380

The work done under cooperative agreement with the States has been restricted to studies of stream flow, except in New Hampshire and California.

Reclamation Service.—The measurement of streams that are to furnish water to reclamation projects under construction has been continued in cooperation with the United States Reclamation Service. The field work is done by Survey engineers who are employed in the locality, and the actual cost is repaid by the Reclamation Service through transfer of funds.

The Survey also continued to assist the Reclamation Service in an investigation undertaken to obtain a basis for the equitable distribution of the waters of Milk and St. Mary rivers—a work carried on under cooperative agreement with the Canadian Department of the Interior.

Office of Indian Affairs.—In accordance with authorization by the Office of Indian Affairs, stream gaging was continued on the Menominee, Crow, Fort Hall, Yakima, Colville, Quinault, Klamath, Warm Springs, Gila River, Western Shoshone, Walker River, and Uinta Indian reservations.

National Park Service.—Streams in the Yosemite and Yellowstone national parks were measured during the year at stations maintained in cooperation with the National Park Service.

Forest Service.—A study of stream flow in the Angeles National Forest, in southern California, was continued in cooperation with the Forest Service.

Investigations were made for the Forest Service in connection with the purchase of lands in Cutts Grant, N. H.

Stream gaging in the Uncompahgre National Forest was done by the Forest Service, which was reimbursed by the Geological Survey.

Weather Bureau.—River gages were installed, checked, and repaired for the Weather Bureau in connection with flood warnings in Florida, Texas, and California.

General Land Office.—An investigation was made of water-power sites in the Coos Bay wagon-road grant, Oreg., in cooperation with the General Land Office.

City of San Francisco.—In connection with the proposed storage of the water of Tuolumne River in Hetch Hetchy Valley as a water supply for the city of San Francisco, measurement of that stream was continued in cooperation with the city government.

PUBLICATIONS.

The publications of the year prepared by the water-resources branch comprise 14 reports and 3 separate chapters. Titles and brief summaries of these publications are given on pages 25-29. At the end of the year 21 reports were in press and 13 manuscripts were awaiting editorial examination.

GENERAL SUMMARY.

Investigations of surface streams have been continued by maintaining gaging stations in 39 States and in Hawaii and Alaska. Co-operation with States and other Federal organizations has made possible the large amount of work in progress. Thirty-two cooperating States (including Hawaii) have contributed \$173,380 for work in these States, and the Indian Office, National Park Service, Forest Service, and Reclamation Service have also contributed largely to the study of the flow of particular streams.

Ground-water investigations have been in progress in 14 States and in the Dominican Republic and Hawaii. The Hawaiian project is a very important one because of the great value of ground water in these islands for municipal, irrigation, and military supplies. The work was made possible by funds supplied by the Territorial government and the city of Honolulu and not included in the above statement.

Many investigations of the present and probable future use of both surface and ground waters have been made in connection with the classification of public lands, with special reference to their use for power, under permit, or for agriculture, under the enlarged-homestead, desert-land, or Carey acts. The results of such investigations are generally incorporated in unpublished special reports to the Commissioner of the General Land Office and to the Secretary of the Interior.

Investigations made during the war in cooperation with the United States Fuel Administration were discontinued in part after the signing of the armistice. However, the statistical studies and the mapping of the transmission lines and electric-power generating plants of public-utility companies have been continued.

DIVISION OF SURFACE WATER.

ORGANIZATION.

The work of the division of surface water consists primarily of the measurement of the flow of rivers, but it includes also special investigations of conditions affecting stream flow and the utilization of the streams.

In carrying on the work the United States is divided into 18 districts, including Hawaii. The location of the districts and district offices and the names of the engineers in charge are given in the following list:

- New England: C. H. Pierce, Customhouse, Boston, Mass.
- New York: C. C. Covert, Journal Building, Albany, N. Y.
- Pennsylvania: O. W. Hartwell, Telegraph Building, Harrisburg, Pa.
- Middle Atlantic and Ohio River: G. C. Stevens, Washington, D. C.
- South Atlantic and eastern Gulf: W. E. Hall, Post Office Building, Atlanta, Ga.
- Tennessee: W. R. King, Customhouse, Nashville, Tenn.
- Upper Mississippi River: W. G. Hoyt, Capitol Building, Madison, Wis.; sub-offices, Kimball Building, Chicago, Ill., and Ames, Iowa.
- Kansas: R. C. Rice, Federal Building, Topeka, Kans.
- Upper Missouri River: W. A. Lamb, Montana National Bank Building, Helena, Mont.
- Rocky Mountain: Robert Follansbee, New Post Office Building, Denver, Colo.
- Great Basin: A. B. Purton, Federal Building, Salt Lake City, Utah.
- Idaho: C. G. Paulsen, Idaho Building, Boise, Idaho.
- Snake River basin: G. C. Baldwin, Federal Building, Idaho Falls, Idaho.
- Washington: G. L. Parker, Federal Building, Tacoma, Wash.
- Oregon: F. F. Henshaw, Post Office Building, Portland, Oreg.
- California-Arizona: H. D. McGlashan, Customhouse, San Francisco, Calif.; suboffices, Federal Building, Los Angeles, Calif., and Tucson, Ariz.
- Texas: C. E. Ellsworth, Capitol Building, Austin, Tex.
- Hawaii: James E. Stewart, Capitol Building, Honolulu, Hawaii.

CHARACTER AND METHODS OF WORK.

Field investigations necessary to the work are made from the district offices, where the results are sufficiently analyzed to insure accuracy and completeness. At selected places, known as gaging stations, the volume of water carried by the streams is measured and records of stage and other data are collected from which the daily flow of the streams is computed. (See Pl. III.) Data collected from the district offices are transmitted to Washington, where they are reviewed in the computing section and prepared for publication. By this review the records obtained in different parts of the country are brought to a uniform standard, and standardization is further effected through annual conferences of the engineers.

At the end of the year 1,349 gaging stations were being maintained, including 76 in Hawaii; 174 stations were discontinued and 272 new stations established during the year. Records for about 190 additional stations were received, ready for publication, from other Government bureaus and private persons, and a number of Government

and State organizations and individuals also cooperated in the maintenance of many of the regular gaging stations.

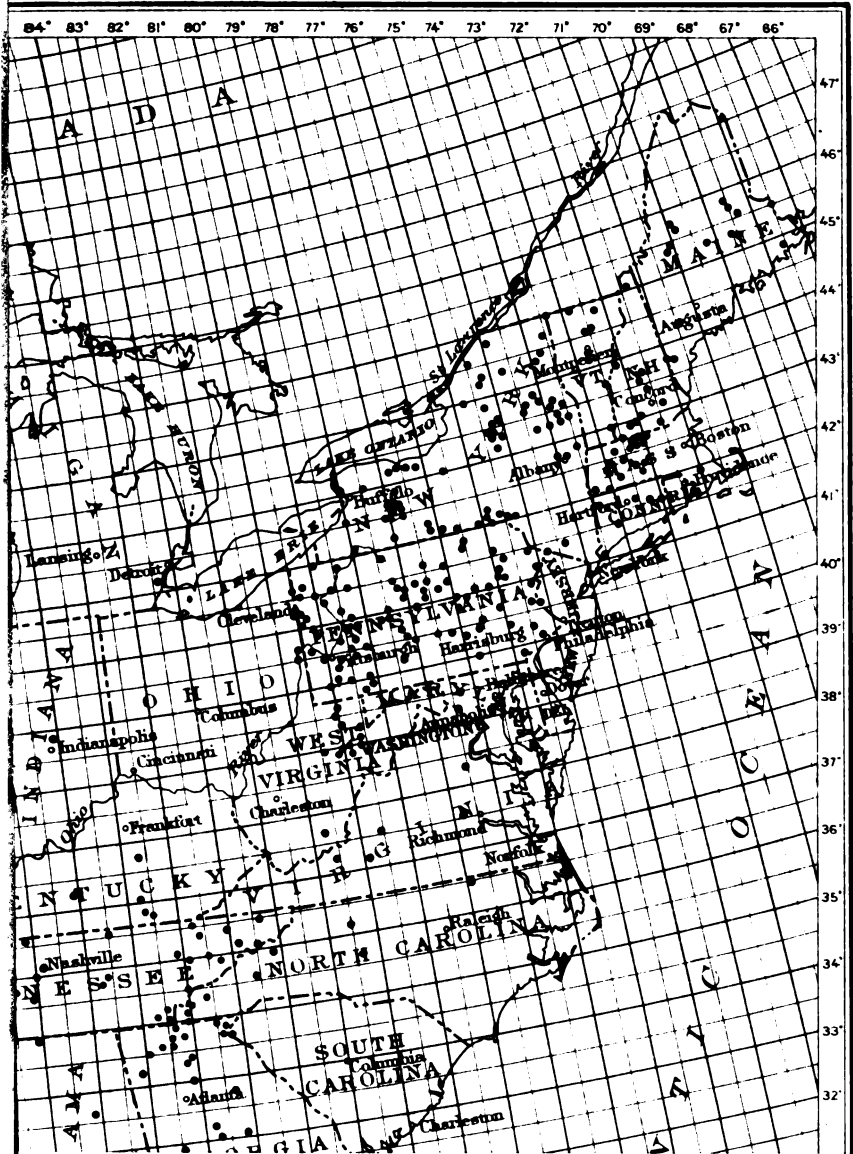
Gaging stations and cooperating parties for the year ended June 30, 1920.

State.	Geological Survey alone.	Regulation Service.	Forest Service.	Indian Office.	Army engineers.	Weather Bureau.	Other Federal bureaus.	State cooperation.	Municipal cooperation.	Private persons.	Counted more than once.	Maintained at end of year.	Established during year.	Discontinued during year.	Regular gaging during year.	Miscellaneous gaging during year.
Alabama						1		2		1		4			2	
Arizona		1		4	2			19		1	4	23	10		336	59
California			26	1		2	4	148	36	36	104	148	9	23	1,124	326
Colorado	3	2	14					13	2	3	1	37	2	8	124	13
Connecticut								5		3	2	6	4		32	1
Florida																
Georgia						3		7		13	1	22	1	1	41	8
Idaho		4	4	14		2		68	1	171	60	204	63	9	1,399	189
Illinois								23	1	1	2	23		1	78	
Indiana										1		1			1	
Iowa						5		22		5	6	26	3	1	143	10
Kansas						1		15				16	5		77	8
Kentucky						1		4				5	1		6	
Maine								16		2	2	16	3	3	80	2
Maryland	3											3			4	
Massachusetts								17				17	1		68	
Michigan										1		1		1		
Minnesota					3	2		5				10	4	1	38	
Montana	8	49	4	7				27		8		98	12	2	385	62
Nevada				3		1		22	4	4	9	22	1	6	78	1
New Hampshire								12		7	7	12	2		46	
New Jersey	1											1			1	
New York					1	4		60	2	11	18	60	6	2	280	51
North Carolina						1		5				9	2	1	24	4
North Dakota							3	9				12		1	12	
Ohio					2							2			4	
Oklahoma																
Oregon		4	1	9		3		14	22	39		92	13	11	253	59
Pennsylvania					9			87	1	4	14	87	87		263	6
South Dakota								1				1			1	
Tennessee						8		20		6	11	23	7		49	4
Texas		1				3		39	5	4	13	39		3	325	535
Utah		1		4				58	2	14	21	58		52	400	70
Vermont								9		2		9	2		25	2
Virginia	2					1						5			8	2
Washington	2	1	5	12			1	7	12	34	1	73	12	8	394	46
West Virginia					6	1		12				12	1		28	
Wisconsin			2		2			44		14	17	45	2	3	216	4
Wyoming		8	5			1	2	42		8	15	51	5	7	150	
Hawaii								76	1	25	26	76	14	19	571	80
	19	72	59	56	25	41	10	909	85	417	344	1,349	272	174	7,035	1,547

PUBLICATIONS.

For convenience and uniformity in publication the United States has been divided into 12 primary drainage basins, and the results of stream measurements are published annually in a series of progress reports that correspond to these 12 divisions. Prior to 1914 the records for each division were contained in a single water-supply paper; since 1914 the records for the twelfth division have been published in three papers. In addition to the progress reports, special reports on various hydraulic subjects have been completed for publication during the year.

The following table shows the division into drainage areas and gives the numbers of water-supply papers containing results of stream measurements for 1899 to 1920:



Number of water-supply papers containing results of stream measurements, 1899-1920.

Year.	I North Atlantic slope (St. John River to York River).	II South Atlantic and eastern Gulf (James to the Mississippi).	III Ohio River.	IV St. Lawrence River and Great Lakes.	V Hudson Bay and upper Mississippi River.	VI Missouri River.	VII Lower Mississippi River.	VIII Western Gulf of Mexico.	IX Colorado River.	X Great Basin.	XI Pacific slope in California.	XII North Pacific slope basins.		
												Pacific slope in Washington and upper Columbia River.	Snake River basin.	Lower Columbia River and Pacific slope in Oregon.
1899 ^a	35	b 35, 36	36	36	36	c 36, 37	37	37	d 37, 38	38, e 39	38, f 39	38	38	38
1900 ^g	47, h 48	48, i 49	49	49	49	49, j 50	50	50	50	51	51	51	51	51
1901.....	65, 75	65, 75	65, 75	65, 75	k 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902.....	82, 83	b 82, 83	82, 83	82, 83	83, 85	84	84	84	85	85	85	85	85	85
1903.....	97	b 97, 98	98	97	k 98, 99, m 100	99	99	99	100	100	100	100	100	100
1904.....	n 124, o 125, p 126	p 126, 127	128	129	k 126, 130	130, q 131	k 128, 131	132	133	133, r 134	134	135	135	135
1905.....	m 165, o 166, p 167	p 167, 168	169	170	171	172	k 169, 173	174	176, r 177	176, r 177	177	178	178	177, 178
1906.....	n 201, o 202, p 203	p 203, 204	205	206	207	208	k 205, 209	210	211	212, r 213	213	214	214	214
1907-8.....	241	242	243	244	245	246	247	248	249	250, r 251	251	252	252	252
1909.....	261	262	263	264	265	266	267	268	269	270, r 271	271	272	272	272
1910.....	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911.....	301	302	303	304	305	305	307	308	309	310	311	312	312	312
1912.....	321	322	323	324	325	326	327	328	329	330	331	332-A	332-B	332-C
1913.....	351	352	353	354	355	356	357	358	359	360	361	362-A	362-B	362-C
1914.....	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915.....	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916.....	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917.....	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918.....	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919.....	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1920.....	521	522	523	524	525	526	527	528	529	530	531	532	533	534

^a Rating tables and index to Water-Supply Papers 35-39 contained in Water-Supply Paper 39. Tables of monthly discharge for 1899 in Twenty-first Annual Report, Part IV.

^b James River only.

^c Gallatin River.

^d Green and Gunnison rivers and Grand River above junction with Gunnison.

^e Mohave River only.

^f Kings and Kern rivers and south Pacific slope basins.

^g Rating tables and index to Water-Supply Papers 47-52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables of monthly discharge for 1900 in Twenty-second Annual Report, Part IV.

^h Washlekon and Schuykill rivers to James River.

ⁱ Scioto River.

^j Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.

^k Tributaries of Mississippi from east.

^l Lake Ontario and tributaries to St. Lawrence River proper.

^m Hudson Bay only.

ⁿ New England rivers only.

^o Hudson River to Delaware River, inclusive.

^p Susquehanna River to Yackin River, inclusive.

^q Platte and Kansas rivers.

^r Great Basin in California except Truckee and Carson river basins.

^s Below junction with Gila.

^t Rogue, Umpqua, and Siletz rivers only.

DIVISION OF GROUND WATER.

GENERAL FEATURES.

The division of ground water investigates the waters that lie below the surface—their occurrence, quantity, quality, and head, their recovery through wells and springs, and their utilization for domestic, industrial, irrigation, and public supplies, and at watering places for live stock and desert travelers. Each year ground-water surveys are made of selected areas where the problems of water supply are most urgent, and the results are published in water-supply papers or other reports. These papers generally include maps showing the ground-water conditions in the areas surveyed. The work is planned with a view eventually to cover the entire country. The investigations relating to quality of water are made in cooperation with the division of quality of water; the surveys in the Atlantic Coastal Plain and in the West Indies are under the supervision of the chief of the section of Coastal Plain investigations, of the geologic branch. The fiscal year 1919-20 was largely devoted to completing the investigations that had been interrupted by the war.

Many projects involving large expenditures for drilling wells to develop water supplies are considered each year by the United States Government, especially by the War and Navy departments. The ground-water division is called upon to furnish information and advice on a large part of these projects.

One of the most important projects undertaken during the year was a survey of the Hawaiian Islands, in which ground water is of great value for municipal, irrigation, and military supplies and on some plantations for the fluming of sugar cane. The recovery and conservation of this water involve problems of much practical importance. The work was begun through the initiative of Prof. H. E. Gregory with funds supplied by the Territorial government and the city of Honolulu.

A comprehensive paper on ground water in the United States, with a discussion of principles, is being prepared by O. E. Meinzer. By the end of the year Part I of this paper, which relates to the occurrence of ground water, was practically completed and Part II, which relates to the origin, circulation, and quantity of ground water, was begun. Each part is to be published as a water-supply paper.

A study of the relation of sea water to ground water along the seacoasts was made by J. S. Brown, who is preparing a report on this subject.

A. J. Ellis continued his work as specialist on mineral waters for the division of mineral resources and, with the aid of Miss B. H.

Stoddard, prepared the report on production of mineral waters in the United States in 1919.

Cooperation with the committee on physiography was continued through Mr. Meinzer, who serves on that committee.

WORK BY STATES.

Arizona.—A paper entitled "Geology and water resources of the Gila and San Carlos valleys in the San Carlos Indian Reservation, Ariz.," by A. T. Schwennesen, was published as Water-Supply Paper 450-A.

Two guides to watering places were completed for the region lying west of Phoenix, Tucson, and Nogales and south of Parker and Wickenburg. These guides are to be published as Water-Supply Papers 490-C and 490-D.

A reconnaissance report on the geography, geology, and hydrology of the lower Gila region, extending, roughly, from Phoenix to Yuma and Parker, was prepared by C. P. Ross and is to be published as a water-supply paper. A brief paper by Mr. Ross on the geology of the region was transmitted to the geologic branch for publication as a contribution to general geology.

A reconnaissance report on the geography, geology, and hydrology of the Papago country, which lies west of Santa Cruz River and south of the Gila, was nearly completed by Kirk Bryan during the year. It is to be published as a water-supply paper. A brief paper on erosion and sedimentation in the Papago country, by Mr. Bryan, was transmitted to the geologic branch for publication as a contribution to geography.

California.—Four reports on ground water in California were published during the year, covering the San Jacinto and Temecula basins; the western slope of San Diego County: Lanfair Valley; and Pah-rump, Mesquite, and Ivanpah valleys. These reports (Water-Supply Papers 429, 446, 450-B, and 450-C) are noticed on pages 26-28.

Of the two guides to desert watering places transmitted in the previous fiscal year, the one on the Salton Sea region (Water-Supply Paper 490-A) was in press at the end of the year. The guide to the Mohave Desert region will be published as Water-Supply Paper 490-B.

A compilation of the Geological Survey's records of water levels in wells in southern California, by F. C. Ebert, was completed and at the end of the fiscal year was ready to be sent to the printer. It is to be issued as Water-Supply Paper 468.

A reconnaissance report on the geography, geology, and hydrology of the Salton Sea region, by J. S. Brown, was transmitted for publication.

A report on Santa Clara Valley was completed by W. O. Clark and at the end of the fiscal year was with the chief of the division for examination and criticism. Measurements of seepage losses from Coyote River and of water levels in wells in Santa Clara Valley were continued during the year.

Additional field work was done during the year in the Mohave region by D. G. Thompson, who is preparing a comprehensive paper on the geography, geology, and hydrology of the region. Mr. Thompson also made a field investigation of the recent developments and ground-water prospects in Antelope Valley, primarily for the information of the Federal Land Bank at Berkeley, Calif.

Water-level measurements were made in selected wells in southern California that have been under observation for a period of years. Many additional observation wells were selected, and seepage measurements were made with a view to obtaining precise data on the intake and discharge of the ground-water reservoirs on which the citrus-fruit industry largely depends. This work is under the immediate direction of F. C. Ebert, hydraulic engineer in the surface-water division.

The large amount of ground-water work in California is made possible through financial cooperation of the State Department of Engineering.

Connecticut.—Three reports relating to areas in Connecticut were in press at the end of the year: "Ground water in the Meriden area," by G. A. Waring (Water-Supply Paper 449); "Ground water in the Southington-Granby area," by H. S. Palmer (Water-Supply Paper 466); and "Ground water in the Norwalk, Suffield, and Glastonbury areas," by H. S. Palmer (Water-Supply Paper 470).

During the year field work was done by J. S. Brown in 18 towns in the New Haven area, and a report on this area was in preparation. In connection with this work Mr. Brown made a special study of the relation of sea water to ground water along the coast and is preparing a paper on this subject.

All ground-water work in Connecticut is done in cooperation with the State Geological and Natural History Survey, H. E. Gregory, superintendent.

Florida.—An investigation of ground water available for the public supply of Miami, Fla., was made by C. P. Ross, and the results were embodied in a brief report that was transmitted to the Florida State Board of Health.

At the request of the United States Public Health Service an investigation of the ground-water conditions on Sea Horse Key, North Key, and Snake Key, in the vicinity of the town of Cedar Keys, Fla., was made by J. S. Brown. A report based on this investigation was transmitted to the Public Health Service.

Hawaii.—Two important ground-water investigations were begun in the Hawaiian Islands, one in the vicinity of Honolulu, by H. S. Palmer, and one in the Kau district, on the Island of Hawaii, by W. O. Clark and L. F. Noble. The investigation in the vicinity of Honolulu is being made for the purpose of advising the city authorities as to the best methods for developing additional ground-water supplies for the city waterworks, especially with respect to the availability of high-level supplies that could be recovered by gravity flow from infiltration tunnels. The investigation in the Kau district relates to the discovery of additional high-level supplies for fluming sugar cane. At the beginning of the work, in February and March, Mr. Meinzer spent seven weeks in field work in the islands to study the ground-water conditions and prospects and to plan the methods of field work. He also made a reconnaissance, with G. K. Larrison, water-supply engineer in the War Department, of the ground-water conditions on the Island of Oahu with reference to the needs of the Army and Navy. Before returning he addressed the Honolulu Chamber of Commerce on the development and conservation of the city's available water supply.

Idaho.—An investigation of the prospects of obtaining additional water supplies for live stock in the Targhee National Forest, Idaho, by drilling wells was made by D. G. Thompson in response to a request from the United States Forest Service. A report based on this investigation was transmitted to the Chief Forester.

Maryland.—The ground-water conditions in the vicinity of Suitland, Md., were examined by O. E. Meinzer, and a brief report on the subject was transmitted to the Secretary of the Interior.

Mississippi.—The investigation of ground water in Mississippi, which was begun in a previous year, was continued in cooperation with the section of Coastal Plain investigations.

Montana.—The investigation of ground water in eastern Montana, which was begun in a previous year, was continued by A. J. Ellis. Mr. Ellis spent a few weeks in field work in Musselshell County to supplement the work previously done and made much progress in the preparation of a report on that county. He also had in preparation a paper on ground water in the region south of Yellowstone River.

An investigation of the ground-water conditions in the vicinity of Helena was made by D. G. Thompson, and a report thereon was transmitted to the Helena Commercial Club. Information on the ground-water conditions in this region was also furnished to the United States Public Health Service for use in connection with a water supply for a hospital at Fort Harrison.

Nevada.—A report on ground water in Pahump, Mesquite, and Ivanpah valleys, by G. A. Waring, was published as Water-Supply

Paper 450-C. These valleys lie partly in Nevada and partly in California.

A report on exploratory drilling for water and use of ground water for irrigation in Steptoe Valley, Nev., by W. O. Clark and C. W. Riddell, was sent to the printer for publication as Water-Supply Paper 467.

Exploratory drilling for water was continued by the State engineer. For this work the United States Geological Survey furnished the drilling equipment which had been used in exploratory drilling in Steptoe Valley.

North Dakota.—For several years H. E. Simpson has been engaged on a comprehensive investigation of ground water in North Dakota for the State geological survey. Near the end of this fiscal year arrangements were made whereby the Federal Survey will furnish assistance, so that the report on this investigation can be promptly completed.

Oklahoma.—A brief paper by D. G. Thompson on ground water for irrigation in the vicinity of Gage, Okla., was transmitted to be published as Water-Supply Paper 500-A. It is based on field work done in the previous year.

South Carolina.—The survey of the ground-water resources of the Coastal Plain of South Carolina was continued in cooperation with the section of Coastal Plain investigations by C. W. Cooke, under the direction of T. W. Vaughan.

Texas.—The work in Texas was carried on in cooperation with the section of Coastal Plain investigations. The field of study included the central and western parts of the Coastal Plain province.

Virginia.—A brief investigation of ground-water conditions in the vicinity of McLean, Va., was made by C. P. Ross, and the results were transmitted to the Secretary of the Interior.

Dominican Republic.—In connection with the work which the United States Geological Survey is doing in the Dominican Republic (see p. 87), C. P. Ross prepared a paper on ground-water prospects in Monte Cristi Valley, with special reference to developing water supplies for irrigation. This paper is based on field work done chiefly in the previous year. It was transmitted to the chief of the section of Coastal Plain investigations.

DIVISION OF QUALITY OF WATER.

The principal work of the quality of water division consists of making analyses of surface and ground waters and interpreting such analyses to determine the suitability of the waters, so far as mineral content is concerned, for domestic and industrial uses. During the year 349 samples of water were analyzed and classified, and calculations and classifications have also been made on about 200 analyses

made elsewhere for use in reports on the quality of the water in different parts of the United States. In addition to the study of the water resources of the United States certain investigations have also been made on the water resources of Haiti and the Dominican Republic. The sections on quality of water in five manuscripts were reviewed during the year.

DIVISION OF POWER RESOURCES.

The work of the division of power resources, which during the fiscal year 1919 was conducted largely in cooperation with the Bureau of Conservation and the Bureau of Mineral Statistics of the United States Fuel Administration, was discontinued in part after the signing of the armistice. The collection of statistics of the production of electric power by public-utility companies and of fuel consumed in producing such power and the mapping of transmission lines and electric-power generating plants of public-utility companies have been continued because of their importance in connection with the pressing problem related to the country's supply of energy and with the conservation of fuels. Miss Bessie B. Borst has been in charge of the section of power statistics, and Guy D. Thomas has directed the section of mapping.

Monthly statistical reports were issued during the fiscal year for March, April, July, October, January, February, and March. Beginning with January, 1920, reports will be issued for each month. It requires about two months to prepare the data of any month for publication.

As estimated from the monthly reports for February, March, April, July, October, and January, the production of electricity in the calendar year 1919 by electric public-utility plants was about 39,000,000,000 kilowatt-hours, 62 per cent of which was produced by fuels and the remainder by water power. The fuels consumed comprised 35,000,000 tons of coal, 11,000,000 barrels of oil, and 21.7 million M cubic feet of gas.

As a basis for the reports of the production of electricity, public-utility companies are requested to submit monthly reports of electricity generated by water power or fuel power and the amount of fuel consumed in generating the electricity reported, if fuel is used. Any concern selling all or a part of the electricity it produces is considered a public utility.

Card indexes of the names and addresses of companies engaged in generating electricity for public use have been maintained and kept up to date and now include about 6,200 companies, of which 1,050 distribute purchased electricity and 1,106 are electric railway companies. These companies operate approximately 5,500 power plants, of which about 4,300 whose generating capacity is 100 kilo-

watts or more are requested to submit monthly reports of their production of electricity and consumption of fuel. Reports are received from plants representing about 90 per cent of the capacity of all the public-utility plants. The output and fuel consumption of plants which do not submit reports are estimated from the best information available.

In preparing the maps showing the location of the power stations and transmission lines used in public service, proof maps were first made from the best information available. Sections of these proof maps were sent to the different companies with the request that the data in regard to their companies shown on the maps be corrected or revised as far as necessary. The companies were also requested to submit information in regard to the characteristics of their transmission lines. From the information submitted final maps, embodying the corrections submitted by different companies, have been prepared. These maps will be published as plates in water-supply papers, which will contain in tabular form information in regard to the equipment of the power stations and the chief characteristics of the transmission lines. Water-Supply Paper 494, Generation and transmission of electric power in the State of New York, was in the editor's hands at the end of the fiscal year. The manuscript of a similar water-supply paper, covering the New England States, has also been practically completed. The preparation of maps of Pennsylvania and New Jersey is in progress.

DIVISION OF ENLARGED AND STOCK-RAISING HOMESTEADS.

During the season of 1919 field work in the examination of lands applied for under the enlarged and stock-raising homestead laws was begun immediately after the passage in July of the act making appropriation for the work during the fiscal year. A force of 32 classifiers of various grades, including 5 assigned from the land-classification board, was engaged in active field work. This force was mostly divided into parties of two or three men, although a number of men worked singly.

During this season applications which were made under the stock-raising homestead law and which were pending in the land districts of the following States were examined: North Dakota, all districts; South Dakota, all districts except a small part of the Timber Lake district; Kansas, all of western part; New Mexico, Durango, Roswell, and Las Cruces districts and about half of the Santa Fe district; Colorado, all districts except a few remote areas; Wyoming, Cheyenne, and Douglas districts, one-fourth of the Evanston district, four-fifths of the Buffalo district, and three-fourths of the Sundance district; Montana, two-thirds of the Miles City district;

Idaho, Hailey district and all but a small part of the Blackfoot district; Oregon, practically all of The Dalles district north of the south line of T. 12 S.; Nevada, all districts.

Field work in the examination of lands applied for under the stock-raising homestead law was begun, for the season of 1920, late in April, and of lands applied for under the enlarged-homestead law early in June. By resignations from the service and by death the force available for field work at the beginning of the season was reduced to 21 men, which includes two men assigned from the land-classification board.

Field examinations of applications pending under the stock-raising homestead law were completed by the end of the fiscal year in the Lemmon and Timber Lake districts, South Dakota; in northwestern Oklahoma; and in the Santa Fe district, New Mexico; and were in progress in the Miles City, Lewistown, Bozeman, Havre, and Helena districts, Montana; the Sundance district, Wyoming; The Dalles district, Oregon; and the Sacramento and Susanville districts, California.

Field examinations of entries under the enlarged-homestead law have been made during the year or were in progress at the end of the year in North Dakota, South Dakota, Montana, Colorado, Wyoming, Idaho, Nevada, Arizona, and California.

Under instructions from the First Assistant Secretary of the Interior an examination was made during July, August, and September of the character of the lands proposed to be included in the Modoc National Forest by the act approved March 3, 1919.

LAND-CLASSIFICATION BOARD.

ORGANIZATION AND PERSONNEL.

The technical work of the land-classification board falls naturally into two major classes, corresponding to the classes of resources with which it deals. These are mineral classification and hydrographic classification, the latter being construed to include the agricultural classification required to be made, as the irrigability of the lands classified is either the chief element or an important secondary element in agricultural classification.

The board is therefore, for administrative purposes, organized into two divisions, the division of mineral classification and the division of hydrographic classification, and the latter division includes three sections, each dealing with an appropriate type of work. At the end of the fiscal year the organization and personnel were as follows:

Chief of board, W. C. Mendenhall, geologist.

Chief engineer and assistant chief of board, Herman Stabler.

Secretary of board, Elsie Patterson.

Division of mineral classification, R. W. Howell, geologist (on furlough); C. D. Avery, mining engineer; N. W. Bass, assistant classifier.

Division of hydrographic classification: Power section, R. W. Davenport and B. E. Jones, hydraulic engineers; N. J. Tubbs, engineer; D. J. Guy, assistant engineer. Irrigation section, J. F. Deeds, engineer; F. J. Sopp, W. N. White, and E. E. Jones, classifiers; C. E. Nordeen, assistant topographer. Grazing section, A. E. Aldous and G. W. Holland, classifiers; J. G. Mathers, assistant engineer; W. L. Hopper and R. O. Helland, assistant classifiers.

The total number of persons on the regular staff of the board at the end of the year was 60. In addition to this regular force, from 20 to 25 classifiers on the rolls of the water-resources branch were amalgamated with the land-classification board staff during the office season in connection with the stock-raising homestead classifications.

The difficulties that all the Government offices encounter in maintaining a staff under present conditions are well illustrated by the fact that although the number employed at the end of the year was approximately the same as at the beginning, there had been 17 separations and 18 additions to the force during the year, a turnover of nearly 30 per cent.

SCOPE AND CHARACTER OF THE WORK.

The land-classification board is charged under the present Survey organization with the task of applying the results of the studies of field problems by the field branches to the administration of the laws affecting the use and disposition of lands and mineral resources, public and reserved. In the fulfillment of this task it utilizes the results that have been accumulated by the Survey during the 40 years and more of its existence, calls for special field examinations by the geologic, topographic, and water-resources branches, when needed, and prepares from the resulting data reports applicable to the particular purpose in view. Thus it supplies to the Department of the Interior and to a minor extent to other departments the facts and the interpretation of the facts necessary to the administration of a variety of complex laws dealing with natural resources. It has prepared and recommended the executive withdrawals temporarily suspending the operation of the coal-land laws until the lands affected could be examined, properly classified, appraised, and restored to entry and purchase at the appraised prices. Similarly it has recommended the creation of the oil, phosphate, and potash reserves until Congress could enact appropriate laws for the disposition of these minerals. It has initiated the placing of public lands valuable for the development of water power in reserves that prevented their acquisition under the homestead and selection laws and has had important duties in facilitating the use of such lands under the laws providing for water-power development. It has drafted

the orders and with the aid of the geologists of the geologic branch it has selected the lands set aside as oil and oil-shale reserves for the use of the Navy in the future. On the basis of information already available or obtained through field examinations by the water-resources branch it has made the classifications required by the enlarged and stock-raising homestead laws. It furnishes to the Land Office and to the Indian Office reports on the character of lands sought under the public-land laws or the laws providing for the disposition of Indian lands.

Its problems are therefore diversified, involving geologic, agricultural, economic, engineering, and semilegal phases, and its staff necessarily includes specialists in geology, engineering, and agriculture, some of whom in addition have a certain amount of training in land law.

As the work done is primarily that of applying the results of scientific and economic researches to the administration of the public-land laws, the character of this work necessarily varies with the enactment of new measures.

Two laws, long awaited, that definitely affect the work of the board were enacted during the first half of 1920. These are the so-called mineral lands leasing act of February 25, 1920 (41 Stat., 437), and the water-power act of June 10, 1920 (41 Stat., 1063). The first of these laws repeals the coal-land laws in force since 1873 and the old placer act as applied to oil and gas, phosphate, and oil shale and substitutes a general leasing law as a means of developing these minerals. The necessity of fixing sale prices on public coal lands therefore ceases, and the oil and phosphate lands locked up in reserves are opened for development. But the new laws are complex and impose certain new duties upon the Geological Survey which fall primarily upon the land-classification board. Among these are the determination of the "known geologic structures of the producing oil or gas fields" and the division of coal, phosphate, and oil-shale lands into appropriate leasing units.

The water-power act provides for its administration by a body called the Federal Power Commission. Certain functions heretofore performed by the land-classification board, such as the consideration of applications and preparation of permits for the development of water power on lands under the jurisdiction of the Interior Department, are among the functions of the new commission. The relations to the commission of other duties concerned with water-power classification that in the past have devolved upon the board can not be determined until the commission's organization is completed and the respective functions of the Government entities involved are determined.

FUNDS.

As during previous years, the work of the board in 1919-20 was supported by allotments made from certain specific Survey appropriations. These allotments were as follows:

Enlarged and stock-raising homesteads.....	\$58,500
Geologic surveys.....	22,500
Topographic surveys.....	8,000
Gaging streams.....	7,000
	<hr/>
	94,000

Congress, however, in the sundry civil act approved June 5, 1920, by a change in the phraseology of the item for the examination and classification of lands and by an increase in the appropriation itself, made independent provision for the classification work for the next fiscal year.

SUMMARY OF WORK OF CLASSIFICATION.

During the year 24,158 acres were classified as to their coal content, 6,449 acres as coal land, and 17,709 acres as noncoal land. As this work was in greater part a revision of earlier classifications the net result was to reduce the total area classified as coal land by 5,144 acres and to increase the total area classified as noncoal land by 16,343 acres. During the year 525,726 acres of coal lands were restored to entry and but 2,797 acres withdrawn.

No oil, potash, or phosphate lands were withdrawn during the year, but 954 acres were classified as nonoil land and restored to unrestricted entry, and 89 acres were eliminated from a potash reserve in California.

Nine "known geologic structures of producing oil or gas fields" were defined toward the end of the year and thus segregated for leasing under the new leasing act of February 25, 1920.

There were no additional classifications of oil-shale lands.

A moderate amount of adjustment of areas included in power-site reserves was made on the basis of new information. An additional area of 62,854 acres of lands valuable for power was withdrawn, and an aggregate area of 40,966 acres, found to be without material value for power purposes, was released from withdrawal. These operations resulted in increasing the area of power-site reserves from 2,565,727 to 2,587,615 acres.

The total area of former Oregon-California Railroad grant lands designated as power-site lands was increased to 141,653 acres, an addition of 380 acres to the area so designated on June 30, 1919. At the end of the year 764,438 acres of land in Arizona and 196,400 acres in New Mexico were included in areas designated as valuable for water-

power purposes under the enabling acts of those States. The change during the year in the areas so designated consists in a reduction of 4,600 acres in the area for New Mexico as a result of redescription in accordance with official survey of land unsurveyed when originally designated. The area in outstanding reservoir withdrawals was increased to 83,693 acres as the result of the withdrawal of 1,714 acres in Wyoming as sites needed for control of water supply.

Operations under the stock-raising homestead laws were an especially noteworthy feature of the classification work of the year. An increase of 54,310,468 acres in lands designated as stock-raising lands, from 20,181,868 to 74,492,336 acres, was the result of a strenuous effort to keep pace with the demands for entry of lands for homesteads to be devoted primarily to stock raising.

Additional areas of 4,583,577 acres were designated as nonirrigable under the enlarged-homestead acts, and 421,337 acres found to have been improperly classified were excluded from designations previously made. The total area remaining so designated at the end of the year is 292,959,481 acres. Of this area, 545,034 acres in Idaho, an increase of 28,797 acres, and 1,503,014 acres in Utah, an increase of 78,740 acres, are classified under the nonresidence provisions of the act as being without domestic water supply sufficient to make continuous residence possible.

The area in public water reserves was increased to 239,283 acres as the result of the addition of 14,367 acres to the area previously so classified and the elimination of 765 acres.

An area of 57,600 acres was designated under the Nevada ground-water reclamation act toward the end of the year.

CORRESPONDENCE.

During the year 34,596 letters and applications of various sorts were received by the land-classification board, about 22 per cent more than the number for the preceding fiscal year. In addition, about 3,000 copies of miscellaneous correspondence from different bureaus were sent to the board for its information and files; this correspondence is made up largely of General Land Office letters to its local officers and of reports on the character of lands by its inspectors and agents, copies of decisions rendered by the Department of the Interior, and Reclamation Service withdrawals and restorations.

Within the year 15,934 letters and reports were prepared in the board. This is an increase of 3.5 per cent over the output for the preceding fiscal year.

For the working days of the year these figures show a daily average of 112 pieces for the incoming correspondence and of 52 for the outgoing.

COOPERATION WITH GENERAL LAND OFFICE.

The cooperation with the General Land Office, under which reports are submitted by the Survey containing information as to the mineral value and water resources of lands for which applications under the public-land laws have been filed, was continued during the year. Similar cooperation exists with the Office of Indian Affairs.

The Survey also furnished to the General Land Office reports on the feasibility of irrigation projects and proposed power developments under the terms of the general cooperative plan between the two bureaus. Closely related to this cooperation is the duty of the Survey to classify land under the enlarged and stock-raising homestead acts and to advise the General Land Office as to appropriate action on applications for land which has been classified. A type of cases not heretofore received consists of applications under the ground-water reclamation act applicable to Nevada only. In these cases, as in enlarged homestead and stock-raising cases, the Survey classifies the land and gives appropriate advice to the General Land Office.

The number of cases requiring such action which have been received and the number considered by the Survey are set forth in the following summary:

General summary of cooperative cases.

Class.	Pending June 30, 1919.	Received during year.	Disposed of during year.	Pending June 30, 1920.	Gain or loss.
Mineral character only:					
General Land Office requests for information....	430	816	317	929	-409
General Land Office field-service reports.....	444	1,158	845	757	-313
Applications for classification as to mineral.....	56	88	92	52	+4
Applications for mineral permits.....	59	84	79	64	-5
Applications for mineral leases.....		2		2	-2
	989	2,148	1,333	1,804	-815
Water resources only:					
General Land Office requests for information....	5	8	7	6	-1
General Land Office field-service reports.....	12	10	12	10	+2
Cases in national forests.....	2	12	14		+2
Applications for reclassification as to water re- sources.....	16	81	68	29	-13
Applications for rights of way.....	38	164	171	31	+7
Lists under Carey Act.....		2	2		
Irrigation-project reports.....	3	37	22	18	-15
Petitions under enlarged-homestead acts.....	4,121	2,780	3,770	3,131	+990
Applications under stock-raising homestead act..	19,721	18,598	23,064	14,455	+5,266
Applications under ground-water reclamation act		127	25	102	-102
	23,918	21,619	27,755	17,782	+6,136
Mineral character and water resources:					
General Land Office requests for information....	1,972	3,576	3,528	2,020	-48
General Land Office field-service reports.....	252	285	223	314	-62
General Land Office requests for information as to water resources, accompanied by field-ser- vice reports as to mineral character.....	76	99	69	106	-30
Indian Office requests for information.....	7	16	9	14	-7
	2,307	3,976	3,829	2,454	-147
Grand total.....	27,214	27,743	32,917	22,040	+5,174

MINERAL CLASSIFICATION.

LEGAL CHANGES.

The character of the classification work required in the administration of the public-land laws was fundamentally changed as to the most important group of nonmetalliferous minerals, through the approval by the President on February 25, 1920, of the act entitled "An act to promote the mining of coal, phosphate, oil, oil shale, gas, and sodium on the public domain" (41 Stat., 437). This act is a leasing act. Under it the Government disposes of the minerals which it owns, as private owners have long disposed of them, not in fee at a nominal flat price but by lease on a royalty basis.

The prime object of the withdrawal policy initiated by the Executive and sanctioned by Congress in the act of June 25, 1910 (36 Stat., 847), namely, to reserve the mineral withdrawn until Congress could pass appropriate laws for their disposition—has thus been accomplished. The mineral reserves are subject to the new law, and the necessity of withdrawals, except occasionally and for special purposes, ceases. The immediate task is to render the leasing act effective by prompt and efficient administration.

The functions of the Geological Survey in the administration of the leasing act—functions exercised primarily through the land-classification board—are to furnish the technical geologic information and the information on relations to production required to administer the law. This type of mineral classification will in the future displace much of that required in the past. Indeed, partly in anticipation of the passage of the new law, partly because most of the coal land needed for immediate development had been appraised and was available for purchase, partly because most of the known public oil and gas and phosphate lands were reserved, and partly because of the Survey's loss of scientific personnel to private industry, there has been relatively little activity in mineral-classification work during the year.

COAL.

Withdrawals and restorations.—Only 2,797 acres of coal lands were withdrawn for classification during the year, and 525,726 acres were restored as a result of classification. Nearly all the lands restored this year, as during the previous fiscal year, were in the lignite area of North Dakota, where all coal lands are appraised at the minimum price. All withdrawn coal lands are rendered available for development through leasehold by the act of February 25, 1920.

Coal withdrawals and restorations, fiscal year 1919-20, in acres.

	Outstanding June 30, 1919.	New with- drawals, 1919-20.	Restorations, 1919-20.	Outstanding June 30, 1920.
Arizona.....	141,945			141,945
California.....	17,643			17,643
Colorado.....	4,500,511		7,004	4,493,507
Idaho.....	4,761			4,761
Montana.....	10,612,032	2,797	1,906	10,612,925
Nevada.....	83,833			83,833
New Mexico.....	5,585,208			5,585,208
North Dakota.....	10,902,615		516,176	10,386,439
Oregon.....	4,361			4,361
Utah.....	5,313,836			5,313,836
Washington.....	824,074		640	823,434
Wyoming.....	2,437,723			2,437,723
	40,428,542	2,797	525,726	39,905,613

Classifications and appraisals.—The end of the fiscal year may be regarded as the end of the period of classifications and appraisals under the old coal-land laws (Rev. Stat., 2347-2352), which have governed the disposition of public coal lands for nearly half a century. Prior to 1906 coal lands had been sold at the minimum price permitted by statute, regardless of the quantity, quality, or accessibility of the coal they contained. Since that year a systematic policy of classification and appraisal has been in effect, and under this policy nearly 30,000,000 acres of coal lands have been classified and appraised at nearly \$1,000,000,000, about 75,000,000 acres have been classified as noncoal land, and nearly 40,000,000 acres, largely coal land, remained withdrawn, awaiting definite classification and appraisal, at the date of the passage of the leasing act, February 25, 1920.

Area and valuation of coal lands, June 30, 1920.

State.	Appraised coal land outstanding June 30, 1919.	Valuation of appraised coal land outstanding June 30, 1919.	Coal land appraised, 1919-20.			Increase and de- crease of ap- raised areas, 1919-20.	Appraised coal land outstanding June 30, 1920.	Valuation of ap- raised coal land outstanding June 30, 1920.
			Total coal land ap- raised.	Coal land re- classified as non- coal land.	Reap- raisals.			
	<i>Acres.</i>		<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	<i>Acres.</i>	
Arkansas.....	60,715	\$1,473,762					60,715	\$1,473,762
California.....	7,720	585,086					7,720	585,086
Colorado.....	2,881,494	195,531,620	3,643			+ 3,643	2,885,137	196,199,767
Idaho.....	4,603	89,624					4,603	89,624
Montana.....	5,783,336	137,410,916	1,446	2,796	7,117	-1,350	5,781,986	137,560,696
Nevada.....	6,803	126,830					6,803	126,830
New Mexico.....	666,205	16,392,111				-8,777	657,428	16,198,951
North Dakota.....	11,409,769	199,382,266	80	8,777		+ 80	11,409,849	199,383,896
Oregon.....	7,195	174,843					7,195	174,843
South Dakota.....	244,874	2,711,462					244,874	2,711,462
Utah.....	1,099,871	45,101,333					1,099,871	45,101,333
Washington.....	1,866	88,360	840			+ 840	2,706	88,360
Wyoming.....	7,238,635	387,820,153	440	20	554	+ 420	7,239,055	387,794,213
	29,383,086	966,838,526	6,449	11,593	7,671	-5,144	29,377,942	967,488,793

Classification of coal and noncoal land June 30, 1920, in acres.

State.	Classification outstanding June 30, 1919.		Net results of classification, 1919-20.		Classification outstanding June 30, 1920.		
	Coal.	Noncoal.	Coal.	Noncoal.	Coal.	Noncoal.	Total.
Arizona.....		42,492		+ 60		42,552	42,552
Arkansas.....	60,715	70,038			60,715	70,038	130,753
California.....	8,720	228,502			8,720	228,502	237,222
Colorado.....	3,366,473	9,357,490	+3,643	+ 3,521	3,370,116	9,361,011	12,731,127
Idaho.....	4,603	8,272,256			4,603	8,272,256	8,276,859
Montana.....	5,897,805	21,804,357	-1,350	+ 1,590	5,896,454	21,805,947	27,702,402
Nevada.....	6,803	2,428			6,803	2,428	9,231
New Mexico.....	684,157	3,753,000	-8,777	+10,877	675,380	3,763,877	4,439,257
North Dakota.....	11,409,769	2,847,354	+ 80		11,409,849	2,847,354	14,257,203
Oregon.....	17,444	1,082,095			17,444	1,082,095	1,079,539
South Dakota.....	244,874	6,961,357			244,874	6,961,357	7,206,231
Utah.....	1,087,992	3,307,091			1,087,992	3,307,091	4,395,083
Washington.....	149,426	1,584,849	+ 840	+ 275	150,266	1,585,124	1,735,390
Wyoming.....	7,413,504	15,491,090	+ 420	+ 20	7,413,924	15,491,110	22,905,034
	30,352,285	74,784,399	-5,144	+16,343	30,347,140	74,800,742	105,147,883

Land classified as coal and noncoal land, fiscal year 1919-20, in acres.

State.	Reclassification.		New classification.		Total classification.			Net increase or decrease of coal and noncoal areas.	
	Pre-vious non-coal, now coal.	Pre-vious coal, now non-coal.	Coal.	Non-coal.	Coal.	Non-coal.	Total.	Coal.	Non-coal.
Arizona.....				60		60	60		+ 60
Colorado.....			3,643	3,521	3,643	3,521	7,164	+3,643	+ 3,521
Montana.....	1,366	2,796	80	160	1,446	2,956	4,402	-1,350	+ 1,590
New Mexico.....		8,777		2,100		10,877	10,877	-8,777	+10,877
North Dakota.....			80			80	80	+ 80	
Washington.....			840	275		840	1,115	+ 840	+ 275
Wyoming.....		20	440		440	20	460	+ 420	+ 20
	1,366	11,593	5,083	6,116	6,449	17,709	24,158	-5,144	+16,343

OIL.

During the year no additions were made to the petroleum reserves heretofore created under the authority of the withdrawal act. The curtailment of field investigations because of the loss of scientific personnel, the fact that the greater part of the public lands believed to contain oil were already withdrawn, and the hope of the early enactment of legislation that would open the reserves to development—a hope realized by the approval of the leasing act February 25, 1920—all contributed to this result. One restoration of 954 acres was made in Montana in a withdrawn area which had been tested

by drilling and had proved barren. The status of withdrawals for the year is indicated by the following table:

Oil withdrawals and restorations, fiscal year 1919-20, in acres.

State.	Withdrawals outstanding June 30, 1919.	Restorations, 1919-20.	Withdrawals outstanding July 1, 1920.
Arizona.....	230,400	.....	230,400
California.....	1,257,229	.....	1,257,229
Colorado.....	222,977	.....	222,977
Louisiana.....	467,080	.....	467,080
Montana.....	1,351,891	954	1,350,937
North Dakota.....	84,894	.....	84,894
Utah.....	1,962,787	.....	1,962,787
Wyoming.....	1,181,626	.....	1,181,626
	6,758,834	954	6,757,880

Immediately after the President's signature of the leasing act thousands of applications for leasing permits were initiated either by posting notices on the ground or by filing the applications in the local land offices. Procedure under the new law, however, was not defined until the approval of the regulations (General Land Office Circular 672), March 11, 1920, and these regulations were not printed and available for general distribution until several weeks later. Meantime a well that indicated the existence of a producing field containing high-grade oil had been brought in on Musselshell River near Mosby, Mont., in what is known as the Cat Creek anticline, in a region that had been partly studied and mapped by the Survey but had not been withdrawn and therefore was open to agricultural entry and selection under several nonmineral-land laws. In order to prevent those nonmineral entries and to segregate the land in the proved area for disposal under the new oil-leasing law, four townships in Montana (T. 15 N., Rs. 29 and 30 E., and T. 14 N., Rs. 30 and 31 E., Montana meridian), containing 91,802 acres, were classified on March 15, 1920, as mineral lands valuable as a source of petroleum and natural gas. This action has been justified by the later development of at least two additional wells with an initial daily capacity of 2,000 or 3,000 barrels of high-grade oil.

In the division among the bureaus of the Department of the administrative functions to be performed under the oil sections of the leasing act, the Geological Survey is required to determine the relations to geologic structure of lands applied for under permit or lease. The law provides that leases only, except under the relief sections of the act, may be granted for lands within any "known geological structure of a producing oil or gas field" and that prospecting permits only may be issued for lands outside producing "structures." Furthermore, only one lease may be issued to one applicant on any one such producing "structure" and only one permit to one applicant

on a single nonproducing "structure." All applications are referred to the land-classification board for a determination of their compliance with these provisions. As rapidly as the necessary information can be collected, the "known structures of producing fields" are defined, and township diagrams indicating their boundaries are transmitted through the Commissioner of the General Land Office to the local land offices, where they become a matter of public record for the guidance of applicants. This work was under way at the end of the fiscal year, nine "structures" of producing fields, with an area of 120,533 acres, having been defined before June 30, 1920, as follows:

State.	Field.	Area (acres).
Montana.....	Cat Creek.....	47,205
Wyoming.....	Dry Piney.....	2,659
Do.....	Mule Creek.....	1,527
Do.....	Lance Creek.....	10,736
Do.....	Thornton.....	1,274
Do.....	Rock Creek.....	4,354
Do.....	Salt Creek.....	34,398
Do.....	Big Sand Draw.....	7,393
Do.....	Hamilton dome.....	11,067
		120,533

The nonproducing "structures" within which prospecting permits may be issued are not formally defined, but individual reports are rendered upon each application. A few such applications had been received from the General Land Office at the close of the year.

POTASH.

Since October 2, 1917, a leasing act for potash (40 Stat., 297) has been in effect similar in principle to the general leasing act for non-metalliferous minerals. The work of the Geological Survey on the classification of potash lands since October 2, 1917, has consisted primarily in reporting on the propriety of issuing potash permits and leases under this act. These reports are recommendations, favorable or adverse, based upon geologic conditions in the area applied for and, in the case of permits, upon the possibility that the mineral sought may be found by proper prospecting methods. If a lease is applied for, the evidence as to discovery of a deposit that offers a reasonable probability of successful commercial development is analyzed.

Under the stimulus of the high prices prevailing during and immediately after the war, many potash prospecting permits were applied for in the western desert basins. With the decline of prices that followed the cessation of hostilities and the gradual resumption of imports, this activity has diminished. Nevertheless, 71 applications were received during 1919-20, as compared with 150 during the preceding year. During the year 175 reports were rendered upon applications, and at the end of the year 55 were awaiting action.

Applications for potash prospecting permits, 1919-20.

Pending July 1, 1919.....	59
Received during year.....	71
Acted on during year.....	75
Pending June 30, 1920.....	55

PHOSPHATE.

Practically all the valuable phosphate deposits on public lands being reserved under the authority of the withdrawal act pending the enactment of legislation for their development, no additional withdrawals were recommended during the year. These reserves, like those containing coal, oil or gas, oil shale, and sodium, are now open to lease under the act of February 25, 1920.

The areas that were withdrawn at the time of the passage of the leasing act are as follows:

	Acres.
Florida	119, 737
Idaho	1, 015, 717
Montana	287, 883
Utah	302, 465
Wyoming	998, 592

HYDROGRAPHIC CLASSIFICATION.**WATER POWER.**

Withdrawals and restorations.—The classification of the public lands with relation to their value in connection with water-power development was continued during the year, the withdrawals being made under the acts of June 25, 1910 (36 Stat., 847, 855, 858), and August 24, 1912 (37 Stat., 497). On July 1, 1919, the area included in withdrawals was 2,565,727 acres. During the year 62,854 acres were withdrawn and 40,966 acres previously included in power-site reserves were restored to entry. Accordingly, on June 30, 1920, the total area withdrawn in connection with water power was 2,587,615 acres.

Power sites withdrawn, restored to entry, and outstanding, fiscal year 1919-20, in acres.

	Withdrawals outstanding June 30, 1919.	New withdrawals, 1919-20.	Restora- tions, 1919-20.	Withdrawals outstanding June 30, 1920.
Alabama.....	120			120
Alaska.....	81,015	10,000		91,015
Arkansas.....	22,354			22,354
Arizona.....	295,848	6,860		302,208
California.....	288,894	4,152		293,046
Colorado.....	277,136	12,111	22,793	266,454
Idaho.....	258,473	1,925	2,007	258,391
Michigan.....	1,240			1,240
Minnesota.....	12,309			12,309
Montana.....	164,431	789	8,579	156,641
Nevada.....	27,543			27,543
Nebraska.....	761			761
New Mexico.....	62,602	2,970		65,572
Oregon.....	422,744	16,714	7,112	432,346
Utah.....	448,698	6,880	475	455,103
Washington.....	113,248	888		114,136
Wyoming.....	88,311	65		88,376
	2,565,727	62,854	40,966	2,587,615

Water-power designations.—The act of June 9, 1916 (39 Stat., 218), revesting in the United States title to lands in Oregon held by the Oregon-California Railroad Co., provides for classification as "power-site lands" of such of the revested lands as are found to be chiefly valuable for water-power sites. The total area classified as power-site lands under the provisions of the act was 141,273 acres on June 30, 1919. During the year 380 acres additional were classified as power-site lands, making a total of 141,653 acres so designated.

The act of February 26, 1919 (40 Stat., 1179), also revested in the United States title to certain lands in Oregon known as the Coos Bay wagon-road grant, which has been held by the Southern Oregon Co., and provides for the classification of these lands in the manner described in the act of June 9, 1916, as above referred to. These lands have been examined by an engineer of the Geological Survey and carefully studied to determine their power value, but no lands have yet been designated.

On July 1, 1919, designations had been made of 764,438 acres of land valuable for water power in Arizona and of 201,000 acres of such land in New Mexico, under the provisions of the enabling acts of those States. During the year, owing to a modification of water-power designation No. 1, New Mexico No. 1, in order to conform the description of a portion of the lands described therein to the official plat, the area designated was reduced 4,600 acres, leaving 196,400 acres designated. The area designated in Arizona remained unchanged.

In general, such of the designated lands as were not otherwise withdrawn have also been included in power-site reserves under appropriate acts of Congress.

Application for reclassification.—At the beginning of the fiscal year 16 applications for the reclassification of lands included in power-site reserve were awaiting action, and during the year 81 were received, making a total of 97 cases. Action was taken on 68, leaving 29 cases pending at the end of the year.

Right of way applications.—Departmental regulations of January 6, 1913, under the act of Congress approved March 4, 1911 (36 Stat., 1235, 1253), and of March 1, 1913, under the act of Congress approved February 15, 1901 (31 Stat., 790), charge the Geological Survey with certain administrative duties in connection with applications for rights of way over the public lands for purposes related to the development, transmission, and use of power. Such applications, when received in proper form at the General Land Office, are transmitted to the Geological Survey for the consideration of such matters as relative priority of applications, incompatibility of works, relative beneficial utilization of resources, and the engineering and economic features involved in the applications and permits. If after such con-

sideration the approval of an application is found to be compatible with the public interest, a draft of an appropriate agreement is prepared, together with a report and recommendations addressed to the Secretary of the Interior reciting the circumstances in the case. This agreement, after execution by the applicant and issuance of the permit by the Secretary of the Interior, defines the conditions under which the power is to be developed and used, the tenure of the site, and the rights of way limits, with a view to the proper protection of the public interest as regards the most beneficial utilization of the resources involved, adequate service, reasonable rates, and a fair return to investors.

The act of Congress approved June 10, 1920 (41 Stat., 1063), known as the Federal water-power act, expressly repeals "all acts or parts of acts inconsistent with this act." It appears in view of the general scope and purpose of this water-power act that no further action on applications under the earlier acts, in so far as they cover the same subject matter, should be initiated. Accordingly, it is thought appropriate to include in this report a brief summary of the work already done by this board under the regulations of January 6 and March 1, 1913.

The following table shows the number of applications for rights of way which have been received for consideration and reported on in each calendar year from 1912 to 1919, inclusive, and for 1920 until June 30, also the number pending June 30, 1920. In this table "(1901)" and "(1911)" refer to the acts of February 15, 1901, and March 4, 1911, respectively.

Applications for rights of way over power sites, 1912-1920.

Received.

	1912 ^a	1913 ^a	1914	1915	1916	1917	1918	1919	1920	Total.
Preliminary permit.....	11	20	11	8	5	6	2	5	3	71
Final permit.....	3	9	4	5	5	9	3	3	3	44
Transmission line (1901).....	5	5	8	6	6	10	7	8	1	56
Transmission line (1911).....	5	5	2	6	5	9	10	9	2	53
Not classified.....	2	3							1	6
	26	42	25	25	21	34	22	25	10	230

^a The figures for 1912 and 1913 include several applications previously filed and resubmitted for consideration under new regulations.

Reported on.

	1912	1913	1914	1915	1916	1917	1918	1919	1920	Total.
Preliminary permit.....	11	20	10	7	5	4	2	3		62
Final permit.....	2	9	4	3	3	5	1	1	2	30
Transmission line (1901).....	5	5	7	6	4	9	6	7	1	50
Transmission line (1911).....	5	5	2	6	5	9	10	9	1	52
Not classified.....	2	3								5
	25	42	23	22	17	27	19	20	4	199

Applications for rights of way over power sites, 1912-1920—Continued.

Pending June 30, 1920.

	1912	1913	1914	1915	1916	1917	1918	1919	1920	Total
Preliminary permit.....			1	1		2		2	3	9
Final permit.....	1			2	2	4	2	2	1	14
Transmission line (1901).....			1		2	1	1	1		6
Transmission line (1911).....									1	1
Not classified.....									1	1
	1		2	3	4	7	3	5	6	31

^a Twenty original applications and 11 applications for reconsideration or for final permits in pursuance of preliminary permit previously issued.

The status of the applications reported on, as shown by the Survey records of July 1, 1920, is as follows:

Preliminary permits:

Rejected or abandoned.....	33
Term lapsed.....	10
Final permit applied for or issued.....	11
In effect.....	5
	59

Final permits:

In effect.....	23
Rejected, revoked, or abandoned.....	5
	28

Transmission line (1901):

In effect.....	41
Rejected, revoked, or abandoned.....	9
	50

Transmission line (1911):

In effect.....	47
Rejected.....	3
	50

Special cases rejected..... 5

Besides the cases listed above there are 7 cases (3 preliminary permits, 2 final permits, and 2 grants) reported out of the Geological Survey, concerning which final action by the Department either has not been taken or has not been reported to the Geological Survey.

In general, applications for rights of way over power sites have been received at an average rate of about 25 a year. The time of consideration of individual applications has of course varied widely. Including the time taken for obtaining additional data from applicants and reports from the different bureaus concerned, the average time between the date of filing in the local land office and the date of the Geological Survey report has been approximately 10 months. As hereinbefore noted, many of the applications for preliminary permits listed in the table for the years 1912 and 1913 had been under consideration previous to those years. When submitted for consideration under the new regulations, they were found to lack certain essential information. The failure of many of the applicants to supply this information resulted in their rejection, as shown above. Applications for preliminary and final permits, not including cases

pending when the Federal water-power act was approved, involved the following total power capacity:

	Capacity in horsepower.	
	Total.	Apportioned to Interior Department lands.
Preliminary permits.....	385,000	285,000
Final permits.....	155,000	65,000
	540,000	350,000

Grants under the act of 1911 and permits under the act of 1901 include over 1,000 miles of transmission-line right of way over vacant Interior Department lands. These transmission lines are practically all constructed, but only a small proportion of the power development authorized has been completed.

A large number of permits were issued by the Secretary of the Interior under the act of February 15, 1901, prior to the issuance of the current regulations, and the permittees have not been required to comply with the later regulations. These early permits involve an estimated capacity of 400,000 horsepower and some 450 miles of transmission line. The complete status of these permits is not available in the records of the Geological Survey.

Pursuant to the instructions of the Secretary, dated August 24, 1916 (45 L. D., 326), permittees under the act of February 15, 1901, and grantees under the act of March 4, 1911, to whom permits and grants have been issued by the Secretary of the Interior since January 1, 1913, were called upon for detailed reports of the operations or developments of their power systems during the calendar year 1919. The reports show that during the year the permittees and grantees generated or transmitted over their systems 3,100,000,000 kilowatt-hours of electric energy. Of this amount 85 per cent was generated by water power. The operating expenses for companies generating 100,000,000 kilowatt-hours or more per year (88 per cent hydro, 12 per cent steam), including taxes and allowances for depreciation, average 6 mills per kilowatt-hour sold. The average sale price of all electric energy sold by the same companies was 12 mills per kilowatt-hour, an increase of 10 per cent over the price in 1918. The energy sold amounts on an average to 77 per cent of the energy generated for companies having extensive distribution systems and an output of over 100,000,000 kilowatt-hours.

Power output of permittees and grantees, 1916-1919.

Year.	Number reporting.	Kilowatt-hours.
1916.....	26	1,200,000,000
1917.....	32	2,000,000,000
1918.....	51	3,200,000,000
1919.....	57	3,100,000,000

During the year favorable reports were made to the Secretary of the Interior on 10 applications for final permits and 1 application for preliminary power permit under the act of February 15, 1901, and 14 applications for grants under the act of March 4, 1911. Of these 25 cases 3 are called applications for reconsideration in the table below.

Several applications involving extensions of time under permits and grants, modifications of stipulations, and approvals of transfers of permits and grants have been considered and reports on them made to the Secretary. A large amount of correspondence of the Interior Department relative to right-of-way matters in general has been initiated by the Geological Survey or has been assigned to it for handling.

In addition to applications for rights of way for hydroelectric development, a large number of applications of other types are referred to the Geological Survey for consideration and report. These embrace applications for rights of way for railroads under the acts of March 3, 1875 (18 Stat., 482), and March 2, 1899 (30 Stat., 990), affecting public lands and Indian reservations, respectively, on which report is made as to whether or not the construction of the railroad will interfere with power or irrigation development on streams in the vicinity of the right of way; applications for rights of way for irrigation uses under the act of March 3, 1891 (26 Stat., 1095), on which report is made as to interference with power development, the feasibility of the project, and other features; applications for rights of way across national forests for mining, milling, and municipal purposes under the act of February 1, 1905 (33 Stat., 628); and a variety of miscellaneous applications for domestic, municipal, mining, and railroad water supply.

Applications for rights of way, fiscal year 1919-20.

	Pending June 30, 1919.	Received, 1919-20.	Acted on, 1919-20.	Pending June 30, 1920.
Railroad: Acts of Congress approved Mar. 3, 1875 (18 Stat., 482), May 14, 1898 (30 Stat., 409), Mar. 2, 1899 (30 Stat., 990), etc.....	7	15	17	5
Irrigation: Acts of Congress approved Mar. 3, 1891 (26 Stat., 1095), May 11, 1898 (30 Stat., 404), etc.....	7	90	91	6
Power: Acts of Congress approved Feb. 15, 1901 (31 Stat., 790), Mar. 4, 1911 (36 Stat., 1235, 1253), etc.....	22	20	22	20
Miscellaneous: Acts of Congress approved Jan. 21, 1895 (28 Stat., 635), May 11, 1898 (30 Stat., 404), May 21, 1896 (29 Stat., 127), Jan. 13, 1897 (29 Stat., 404), Feb. 15, 1901 (31 Stat., 790), Feb. 1, 1905 (33 Stat., 628), Mar. 4, 1911 (36 Stat., 1253, 1254), etc.....	2	39	41	0
Total number of applications for original consideration...	38	164	171	31
Additional applications for reconsideration.....	16	16	21	11

During the year one Carey Act segregation list was received, and a report on it was forwarded to the General Land Office. One case of this type was submitted by the General Land Office for reconsideration during the year, and the case was returned with appropriate supplemental report.

At the beginning of the year three cases were pending awaiting reports to the General Land Office under the instructions from the Secretary of the Interior of March 15, 1913, relative to irrigation projects whose water rights or shares of stock are presented as evidence of compliance with the requirements of the desert-land act, or reports as to the feasibility from an engineering and economic standpoint of applications under the irrigation-district law of August 11, 1916 (39 Stat., 506). During the year 37 new cases were received and reports were submitted to the General Land Office in 22 cases, leaving 18 cases pending June 30, 1920. One case of this type submitted for reconsideration was pending at the beginning of the year, and 9 additional cases were received during the year. Three of these cases were acted upon, leaving 7 pending at the end of the fiscal year.

RESERVOIR WITHDRAWALS.

One withdrawal in connection with water-storage reservoir-site investigations has been made during the year. This withdrawal embraces two reservoir sites in Wyoming said to be valuable in connection with the control of general water-supply conditions in Bear River valley, Utah.

Reservoir withdrawals outstanding June 30, 1920.

	Acres.
Arizona.....	23,040
Colorado.....	1,728
Montana.....	9,080
North Dakota.....	1,569
Oregon.....	10,619
Washington.....	35,943
Wyoming.....	1,714
	<hr/> 83,693

ENLARGED HOMESTEADS.

Classification of lands under the enlarged-homestead acts of February 19, 1909 (35 Stat., 639), June 17, 1910 (36 Stat., 531), June 13, 1912 (37 Stat., 132), March 3, 1915 (38 Stat., 953), March 4, 1915 (38 Stat., 1162), July 3, 1916 (39 Stat., 344), September 5, 1916 (39 Stat., 724), and February 20, 1917 (39 Stat., 925), was continued during the year. As a result of the investigations of surface and ground-water conditions made during the fiscal year in conjunction

with data obtained previously, action based on Survey classifications has been taken in nearly all cases, the general exceptions being those involving lands within the exterior limits of irrigation projects requiring further investigations.

Action on petitions under the enlarged-homestead acts, fiscal year 1919-20.

State.	Pend- ing June 30, 1919.	Re- ceived, 1919-20.	Total.	Action taken, 1919-20.						
				All desig- nated.	Part desig- nated.	Re- fused.	Re- called.	Total.	Pend- ing June 30, 1920.	Cases recon- sidered.
Arizona.....	44	146	190	16	.....	2	16	34	156	5
Arkansas.....	1	.....	1	.....	.....	.....	.....	.....	1	.....
California.....	317	138	455	275	4	2	4	285	170	19
Colorado.....	564	620	1,184	492	12	11	9	524	660	45
Idaho.....	406	238	643	313	7	111	24	455	188	60
Kansas.....	15	45	60	8	.....	1	1	10	50	.....
Michigan.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Minnesota.....	1	.....	1	1	.....	.....	.....	1	.....	.....
Montana.....	883	492	1,375	792	13	14	41	860	515	124
Nebraska.....	1	1	2	1	.....	.....	.....	1	1	.....
Nevada.....	40	10	50	24	.....	11	1	36	14	.....
New Mexico.....	329	252	581	222	3	2	7	234	347	17
North Dakota.....	152	71	223	95	9	7	2	113	110	16
Oklahoma.....	.....	2	2	.....	2	.....	.....	2	.....	.....
Oregon.....	166	100	266	201	15	2	3	221	45	11
South Dakota.....	232	56	288	119	4	3	1	127	161	8
Utah.....	467	186	653	297	6	49	11	363	290	25
Washington.....	197	74	271	186	5	20	3	214	57	21
Wyoming.....	307	349	656	259	4	12	15	290	366	44
	4,121	2,780	6,901	3,301	84	247	138	3,770	3,131	405

The general provisions of the acts, which apply in 14 States, permit the entry by one person of 320 acres of "nonmineral, nonirrigable, unreserved, and unappropriated surveyed public lands which do not contain merchantable timber." Entries may be allowed for the surface only of mineral land containing coal, phosphate, nitrate, potash, oil, gas, or asphaltic minerals. As a prerequisite to the allowance of an entry under these acts the land must have been designated by the Secretary of the Interior as not being, in his opinion, "susceptible of successful irrigation at a reasonable cost from any known source of water supply." Under the provisions of sections 6 of the acts of February 19, 1909, and June 17, 1910, applicable in Utah and Idaho only, the Secretary may further designate lands which do not have upon them "such a sufficient supply of water suitable for domestic purposes as would make continuous residence upon the lands possible," and entrymen upon such lands are relieved of the necessity of residence.

Since the enactment of the preference-right amendment to the enlarged-homestead act, March 4, 1915 (38 Stat., 1162), the entire energy available for enlarged-homestead classification work has been required for considering individual petitions for designation by pros-

pective entrymen. In consequence, general designations of large areas are made only rarely.

Enlarged-homestead designations, fiscal year 1199-20, in acres.

State.	Outstanding July 1, 1919.	Designations, 1919-20.	Cancellations, 1919-20.	Outstanding June 30, 1920.
Arizona.....	25,489,483	10,880	4,040	25,496,323
California.....	8,415,211	410,495	.....	8,825,736
Colorado.....	28,774,359	419,075	5,160	29,192,274
Idaho:				
Secs. 1-5 and 7.....	10,319,499	206,510	21,907	10,501,132
Sec. 6.....	516,237	28,957	160	545,034
	10,835,736	235,467	25,067	11,046,166
Kansas.....	518,754	23,720	.....	572,474
Montana.....	50,695,905	492,125	600	51,157,431
Nevada.....	46,301,756	81,702	2,960	46,383,496
New Mexico.....	31,519,989	639,774	.....	32,159,763
North Dakota.....	11,910,717	32,125	.....	11,942,842
Oregon.....	18,934,987	641,148	2,400	19,577,735
South Dakota.....	15,901,760	174,795	348,170	15,728,385
Utah:				
Secs. 1-5 and 7.....	7,684,195	215,080	32,180	7,867,095
Sec. 6.....	1,421,274	79,340	600	1,503,014
	9,105,469	294,420	32,780	9,370,109
Washington.....	5,566,658	406,205	160	6,032,703
Wyoming.....	24,912,426	661,616	.....	25,474,042
	288,797,211	4,583,577	421,337	292,950,481

STOCK-RAISING HOMESTEADS.

The stock raising homestead law, approved December 29, 1916 (39 Stat., 862), authorizes the Secretary of the Interior to designate unreserved public lands in any of the public-land States, but not in Alaska, as "stock-raising lands." The lands to be designated are those whose surface is chiefly valuable for grazing and raising forage crops and which do not contain merchantable timber, are not susceptible of irrigation from any known source of water supply, and are of such character that 640 acres is reasonably required to support a family.

Although the field force was materially reduced, greater progress was made in the classification of lands under this act than in previous years. This progress was effected largely by the use of the accumulated field data collected during the period the law has been in operation. Toward the end of the fiscal year the work had reached such a stage that general designations of lands other than those individually applied for was possible, and several million acres were designated in this manner.

The area designated during the fiscal year, 54,312,588 acres, was more than two and one-half times the total designated prior to July 1, 1919, and although the number of cases closed was somewhat less

than in the previous year, a material reduction was made in the number of cases pending. Since the law became effective 81,713 applications for designation have been received, of which 67,258 have been acted upon.

Stock raising homestead designations, fiscal year 1918-19, in acres.

State.	Outstanding July 1, 1919.	Designations, 1919-20.	Cancellations, 1918-19.	Outstanding June 30, 1920.
Arizona.....	291, 120	2, 151, 950		2, 443, 070
Arkansas.....	240			240
California.....	365, 380	3, 896, 586		4, 261, 966
Colorado.....	2, 674, 964	2, 800, 757	40	5, 475, 681
Idaho.....	445, 389	2, 418, 425		2, 863, 814
Kansas.....	57, 604	31, 070		88, 674
Michigan.....		320		320
Montana.....	2, 401, 790	5, 977, 437		8, 379, 227
Nebraska.....	38, 648	56, 760		95, 408
Nevada.....	28, 980	102, 039		131, 019
New Mexico.....	5, 083, 090	17, 670, 063		22, 753, 153
North Dakota.....	191, 418	110, 441		301, 859
Oklahoma.....	22, 481			22, 481
Oregon.....	1, 040, 907	4, 283, 134	320	5, 323, 721
South Dakota.....	1, 782, 525	4, 415, 582		6, 198, 107
Utah.....	52, 410	611, 950		564, 360
Washington.....	207, 536	123, 758		331, 294
Wyoming.....	5, 497, 386	9, 762, 316	1, 760	15, 257, 842
	20, 181, 868	54, 312, 588	2, 120	74, 492, 336

Stock raising homestead petitions, fiscal year 1919-20.

State.	Pending June 30, 1919.	Re- ceived, 1919-20.	Total.	Action taken, 1919-20.					Pending June 30, 1920.	Recon- sidered cases.
				All desig- nated.	Part desig- nated.	Re- fused.	Re- called.	Total.		
Arizona.....	438	405	843	241	3	11	54	309	534	355
Arkansas.....	1	2	3	1				1	2	
California.....	1, 751	682	2, 433	1, 161	25	51	23	1, 260	1, 173	286
Colorado.....	2, 036	2, 502	4, 538	2, 860	64	92	73	3, 089	1, 449	233
Idaho.....	2, 273	761	3, 034	1, 875	152	210	60	2, 297	737	248
Kansas.....	61	40	101	57	1	2		60	41	
Michigan.....		4	4	1				1	3	
Montana.....	3, 142	3, 172	6, 314	2, 426	44	161	286	2, 917	3, 397	248
Nebraska.....	81	112	193	141	1			142	51	1
Nevada.....	123	85	208	112	14	13	8	147	61	13
New Mexico.....	2, 104	2, 159	4, 263	1, 946	47	53	15	2, 061	2, 202	1, 624
North Dakota.....	236	124	360	229	17	18	4	268	92	40
Oklahoma.....	40	51	91			1		1	90	3
Oregon.....	2, 002	1, 216	3, 218	2, 344	120	168	10	2, 642	576	251
South Dakota.....	1, 466	1, 081	2, 547	2, 004	18	47	34	2, 103	444	167
Utah.....	1, 230	228	1, 458	757	40	9	4	810	648	101
Washington.....	396	237	633	255	9	8	4	276	357	20
Wyoming.....	2, 341	5, 537	7, 878	5, 138	47	61	34	5, 280	2, 598	384
	19, 721	18, 398	38, 119	21, 546	602	905	609	23, 664	14, 455	3, 973

PUBLIC WATER RESERVES.

Withdrawals of tracts containing watering places located in regions largely devoid of sources of water supply for stock grazing on surrounding open public range were continued during the year, and restorations from such withdrawals were also made. These re-

reserves are created under the act of June 25, 1910 (36 Stat., 847), as amended by section 10 of the act of December 29, 1916 (39 Stat., 862), in order that control of the water on the land withdrawn may be retained in the Government. Efforts of private individuals to develop and protect the water supply on such lands from damage and pollution, however, will be encouraged by granting special privileges to such individuals through the issuance of permits under the act of February 15, 1901 (31 Stat., 790).

Areas amounting to 14,367 acres were included in public water reserves during the year, and 765 acres were eliminated from such reserves on the basis of information obtained through field examination by the General Land Office and the Survey.

Public water reserves withdrawn, restored to entry, and outstanding, fiscal year 1919-20, in acres.

State.	Withdrawals outstanding July 1, 1919.	New withdrawals, 1919-20.	Restorations, 1919-20.	Withdrawals outstanding June 30, 1920.
Arizona.....	13,828	335	180	14,001
California.....	56,034	3,812	85	59,761
Colorado.....	1,900			1,900
Idaho.....	7,040	3,600		10,640
Montana.....	7,284	440		7,724
Nevada.....	4,833	2,020		6,853
New Mexico.....	3,361	2,680		6,041
Oregon.....	11,744	640		12,384
South Dakota.....	240			1,240
Utah.....	34,867	720		35,587
Washington.....	809	120		929
Wyoming.....	83,752		520	83,232
	225,681	14,367	765	239,283

GROUND-WATER RECLAMATION IN NEVADA.

The ground-water reclamation act of October 22, 1919 (41 Stat., 293), authorizes the issuance of permits to citizens of the United States or associations of such citizens, giving the exclusive right to conduct explorations within the limit of 2,560-acre tracts of a certain type of land in Nevada for the purpose of obtaining a water supply for irrigation from wells. The act provides that land covered by these permits shall have been designated by the Secretary of the Interior as nonmineral, nontimbered, and not known to be susceptible of successful irrigation at a reasonable cost from any source of water supply. Instructions were issued March 19, 1920, directing the preparation of the orders of designation in the Geological Survey, and the furnishing of appropriate advice to the Commissioner of the General Land Office in all cases involving applications for permits under this act. An area of 57,600 acres had been designated under the terms of this act at the end of the year.

PUBLICATION BRANCH.**DIVISION OF BOOK PUBLICATION.****SECTION OF TEXTS.**

During the year 28,700 pages of manuscript were edited and prepared for printing, and proof sheets comprising 2,664 galley proofs and 20,251 page proofs were read and corrected. Indexes were prepared for 40 publications, covering 8,044 pages. The publications of the year are listed and abstracted on pages 12-30.

At the end of the fiscal year seven persons were employed in this section. The water-resources branch has continued to render special assistance in preparing copy and reading proof.

SECTION OF ILLUSTRATIONS.

The number of illustrations prepared was 2,440, including 251 miscellaneous maps, 288 photographs, 388 diagrams and sections, 1,308 paleontologic drawings, and 205 miscellaneous illustrations. The illustrations transmitted to accompany manuscripts numbered 783, to be reproduced by chromolithography, photolithography, half-tone engraving, zinc etching, the four-color process, and cuts already engraved. The number of proofs received and examined was 801. At the end of the year material for illustrating 57 separate reports and chapters is on hand, 21 of which are 10 to 90 per cent completed. The number of reports now on hand for which illustrations are to be completed is greater than at the end of any previous year. During the year an unusual number of large and difficult illustrations have received attention, such as the maps that accompany two reports on desert watering places.

DIVISION OF DISTRIBUTION.

Editions of 153 new books and pamphlets, 30 reprinted books and pamphlets, 2 new geologic folios, 4 new geologic maps, 69 new or revised topographic maps, and 114 reprinted topographic maps, making a total of 372 publications, were received during the year. Many other special pamphlets and forms, prepared for administrative use, were received and distributed.

The total units of all publications received numbered 621,649 books and pamphlets, 7,208 folios, 323 geologic maps, and 711,872 topographic and other maps, a grand total of 1,341,052.

The division distributed 621,132 books, 17,954 folios, and 898,388 maps, a total of 1,537,474, of which 12,117 folios and 707,252 maps were sold. The total amount received and deposited in the Treasury as the result of sales of map publications was \$43,977.08, including \$42,723.73 for topographic and geologic maps and \$1,253.35 for geologic folios. The division received and answered 107,774 letters.

DIVISION OF MAP EDITING.

SECTION OF GEOLOGIC MAPS.

The publication of geologic folios was resumed during the year. Two folios were completed and published, Nos. 209 and 210. (See pp. 29-30.) The maps of Folio 211 (Elkton-Wilmington, Md., Del., Pa.) were printed, and the text reached the stage of page proof. Some of the maps of Folio 212 (Syracuse-Lakin, Kans.) were printed. The maps of Folio 213 (New Athens-Okawville, Ill.) reached the stage of stone proof. Progress was made in the engraving of the large geologic map of the Black Hills (S. Dak.) folio and of the three maps of the Brilliant-Raton-Koehler (N. Mex.-Colo.) folio.

The maps of Part I of the World Atlas of Commercial Geology (72 in all) were well advanced; about half of them were completed, one-fourth were in color proof, and the drawings for the remainder were completed.

During the year G. W. Stose, geologist in charge of the section, edited the maps and illustrations for 42 reports other than folios.

SECTION OF INSPECTION AND EDITING OF TOPOGRAPHIC MAPS.

The number of topographic maps in progress in the office (exclusive of engraving and printing) ranged from 52 in November to 113 in March; the monthly average was 77. During the year 92 topographic maps were completely drafted and approved, and 84 of them were sent to the engraving division for advance-sheet photolithography; 84 maps were edited for engraving, 119 maps or sheets were edited as illustrations for 25 Survey reports, and corrections on 178 maps were edited for reprints. Engraved proof was read on 61 new topographic maps and corrections to 65 reprints. Index maps for 12 State circulars were revised. During the year 69 new topographic maps were published (58 engraved on copper and 11 printed by three-color photolithography), and at the end of the year 83 maps were in process of engraving and printing, and 62 maps were on hand in the section for completion of drafting or inspection and editing. A new class of topographic publications (for War Department distribution only) comprised 6 large special maps for artillery use in the Army, reproduced by engraving on copper and photolithography, mostly on the scale of 1:10,000, copy for which was prepared and reproduction proof read by this section.

The section continued in direct charge of the preparation of reports giving confidential military information to the War Department, of which 61 were transmitted during the year. Progress on reports not yet transmitted and mostly awaiting printing of base maps represents an equivalent of 15 reports.

W. M. Beaman spent September and October in a field inspection of topographic parties in the central, northwestern, and Pacific divisions. L. S. Leopold was detailed to the National Park Service from September to December, inclusive, for topographic field work in Yosemite Valley, Calif. James McCormick was designated February 28 as the representative of the Geological Survey on the United States Geographic Board, in place of R. B. Marshall, resigned.

An average of 16 employees were engaged in the work of the section for the year.

DIVISION OF ENGRAVING AND PRINTING.

TOPOGRAPHIC MAPS AND FOLIOS.

During the fiscal year 58 new topographic maps were engraved and printed, 9 new topographic war maps were photolithographed and printed in black and colors, 1 new topographic map of Willamette Valley, Oreg. (sheet 9), was photolithographed and printed in black and colors, and 1 new State map, Arizona, scale 1:500,000, was photolithographed and printed in black only, making a total of 69 new maps printed and delivered.

Corrections were engraved on the plates of 164 maps, of which 106 were for reprint editions, 35 were in hand for printing, and 23 were corrected for other purposes. Seven photolithographic State maps were corrected and reprinted, and one topographic map in hand at the beginning of the year was completed.

Of the new and reprinted maps 183 editions, amounting to 711,872 copies, were printed and delivered to the map room. This is a decrease of 177 editions and 233,421 copies from the preceding year.

Two new geologic folios (see pp. 29-30) were published during the year, one more than last year. The editions of these folios amounted to 7,208 copies, an increase of 3,335 copies over the preceding year, Extra geologic maps of these folios amounting to 323 copies were also delivered.

OTHER GOVERNMENT MAP PRINTING.

The following war work was done for different branches of the War Department and for other branches of the Government: For the office of the Chief of Staff, 266 grained zinc plates bearing the transferred work of the Carta de la República Mexicana, United States map showing coal regions, weekly statistical reports 130 to 148 (530 pages); for the office of the Director of Air Service, outline map of the United States; on order of the office of the Chief of Ordnance, 3 large position mirrors were ruled in centimeter squares; for the Federal Board of Vocational Education, editions of 7 forms,

25 charts, 17 diagrams, blue prints, rectigraphs, bromide enlargements, and miscellaneous photographic work; for the Bureau of War Risk Insurance, a large amount of photographic work, including editions of 443 pages of reports and organization charts; for the Treasury Department (War Loan Organization), 300,000 maps of New Europe; for the Bureau of Mines, under appropriations for argon-gas investigations, lantern slides, blue prints, and miscellaneous photographic work. Miscellaneous war work was also done for the Constructing Quartermaster (Harwood's Mill Water Development), Chemical Warfare Service (Edgewood Arsenal), General Service Schools (Fort Leavenworth, Kans.), Engineer Map Reproduction Plant, Washington Barracks, D. C., United States Shipping Board, Director of Americanization, and United States Grain Corporation. The following war work was done through the topographic branch: Thirty-six special engraved and photolithographed military maps; maps of Fort Omaha balloon field (1 sheet), Camp Jackson (4 sheets), Camp Abraham Eustis (1:20,000 scale), Camp Bragg (8 sheets), Camp Hancock (1 sheet), and Camp Knox (4 sheets). Work was continued during the year on the World Atlas of Commercial Geology.

For the Government Printing Office the following items were printed and delivered: Illustrations for the annual reports of the governor of Alaska, the governor of Hawaii, the Surgeon General (United States Navy), the Commissioner General of Immigration, the Director of National Parks, the War Department (vol. 1), the Board of Regents of the Smithsonian Institution, the Department of the Interior (Indian Affairs and Territories), vol. 2, and the Director of the United States Geological Survey; reports on preliminary examination of Lorain Harbor, Ohio, Hillsboro River, Fla., Tangipahoa River, Fla., and Black Bay of Biloxi, Miss. (H. Docs. 254, 256, 257, and 258, 66th Cong., 1st sess.); final report of Gen. John J. Pershing (H. Doc. 626, 66th Cong., 2d sess.); report on protection of Galveston, Tex. (H. Doc. 693, 66th Cong., 2d sess.); report on Gila River flood control (S. Doc. 436, 65th Cong., 3d sess.); War Department, War Documents 951, 968, 988, 990, Tariff books for Washington-Alaska military cable and telegraph system, Occasional Papers 58 (The evolution of the art of fortification, Engineer School, United States Army); Navy Department, Ordnance Pamphlet 378, Inspection Bulletin 2, Inspection districts under the Bureau of Construction and Repair, Compilation of data on foreign countries for use of the fleets, and Compilation of military data (maps of Mexico); Bureau of Ethnology Bulletin 73; Bureau of Mines Bulletins 64, 98, and Technical Paper 155; Department of Commerce, Special Publication 63; American Nautical Almanac, 1921 and 1922; American Ephemeris and Nautical Almanac, 1920, 1921, and 1923; Geological

Survey Bulletins 656, 661, 686-B, 686-C, 686-D, 686-E, 686-F, 686-G, 686-H, 686-J, 686-K, 686-L, 686-T, 686-U, 686-V, 686-W, 691-B, 691-C, 691-E, 691-G, 691-H, 697, 704, 711-B, 711-C, 711-F, 711-G, 711-H, 712-E, 713, 716-A, 716-B, Professional Papers 115, 116, 125-B, Water-Supply Papers 447, 450-A, 450-C, 490-B, 490-C, 490-D; Mineral Resources, 1918, chapters on peat, manganese and manganiferous ores, and asphalt and allied substances, pamphlet on preparation of illustrations for reports of the United States Geological Survey. In addition the following separate illustrations were printed and delivered to the Government Printing Office: For the War Department, 43 instruction charts, maps and diagrams for final report of Gen. John J. Pershing; for the Navy Department, organization chart, Bureau of Supplies and Accounts, plans for navy yards and stations, Chart IV (logarithmic scale); for the National Park Service, panoramic view of Mount Rainier National Park, sketch map of Yosemite National Park, maps for rules and regulations for five national parks, maps for seven circulars giving general information regarding national parks; for the Forest Service, protractor forms; for the National Forest Reservation Commission, maps showing progress of purchase of eastern national forests; for the General Land Office, maps of Oregon-California Railroad lands, one Indian reservation, one camp and military reservation, mineral survey plat sheet, Form 4-675-b (township plat), posters advertising sale of public lands, and plats of 7 town sites; for the Office of Farm Management, base and outline maps of the United States by counties and States, and maps of South America; for the Bureau of Animal Industry, maps showing quarantine for Texas fever of cattle; for the Bureau of Entomology, maps showing spread of the Mexican cotton-boll weevil, and maps showing areas quarantined for the gypsy moth and brown-tail moth; for the Department of State (International Joint Commission), maps showing water supply of St. Mary and Milk rivers; for the Alaskan Engineering Commission, industrial map of Fairbanks section, Alaska, and maps showing construction of Government railroads in Alaska; for the Superintendent of Documents, maps of the United States by counties; for the Department of Justice, diagrams for use in case of the United States v. the Steel Corporation; for the Bureau of the Census, maps showing birth and death registration areas; for the Department of the Interior, maps of the Hawaiian Islands; for the Bureau of Education, maps of Alaska showing public schools and reindeer stations; for the Bureau of Mines, gasoline-blending chart.

The following work was done for other bureaus and departments: For the Department of the Interior, graphic chart, bromide enlargements, rectigraph prints, and miscellaneous photographic work; for the Reclamation Service, 37 maps of projects, 40 farm-unit plats of

projects, 3 town-site plats of projects, 3 supplemental plats of projects, 6 maps of Idaho and Oregon, 62 standard designs, diagrams, forms, and tracings, map showing location of projects, log sheet, transportation slips, progress chart, travel-order blank, discharge tables, lantern slides, and miscellaneous photographic work; for the General Land Office, 1,438 township plats, 527 mineral plats, plats of 3 town sites, 13 State maps showing enlarged-homestead areas, map showing survey of boundary line between Oklahoma and Texas, and miscellaneous photographic work; for the Bureau of Mines, map of Hewitt oil field, charts, diagrams, blue prints, lantern slides, and miscellaneous photographic work; for the Alaskan Engineering Commission, maps showing Government railroads in Alaska, map of Fairbanks district, progress map, statement forms, and miscellaneous photographic work; for the Office of Indian Affairs, maps of 4 Indian reservations, map showing Indian reservations west of Mississippi River, lantern slides, bromide enlargements, and miscellaneous photographic work; for the National Park Service, 12 automobile-guide maps, 1 automobile tour map, map showing proposed enlargement of Crater Lake National Park, map showing proposed Roosevelt National Park in relation to the Yosemite National Park, map showing national park-to-park highways in the western United States, automobile wind-shield stickers for 14 national parks, fire-warning signs, park signs, labels, bromide enlargements, lantern slides, rectigraphs, and miscellaneous photographic work; for the Bureau of Standards, editions of 455 pages of technical manuscript, millimeter ruling, forms, diagrams, and miscellaneous photographic work; for the Forest Service, maps of 59 national forests, 14 proclamation maps of national forests, 26 maps for atlas folios, 7 recreation maps of national forests, 140 homestead-entry plats, triangulation record, allotment-estimate sheets, forms, diagrams, and other miscellaneous work.

Miscellaneous work was also done for the Department of Commerce, Interstate Commerce Commission, Department of Labor, Bureau of Entomology, Weather Bureau, States Relations Service, Bureau of Public Roads, Post Office Department, Hydrographic Office, St. Elizabeth's Hospital, Bureau of Foreign and Domestic Commerce, Coast and Geodetic Survey, International Boundary Commission, and Commission of Fine Arts.

This work for other branches of the Government included many reprint editions and amounted to about \$125,000, for which the appropriation for engraving and printing geologic maps was reimbursed by transfer of credit on the books of the United States Treasury.

Work was also done for the State engineer and surveyor, Albany, N. Y.; Electrical World, New York City; A. Hoen & Co., Baltimore, Md.; Dominican Topographic Survey; J. B. Lyon Co., Albany, N. Y.; Snyder & Black, New York City; J. C. Hoyt, water-resources

branch, United States Geological Survey; John W. Hallowell, Assistant to the Secretary, Department of the Interior; Tennessee State Geological Survey, Nashville, Tenn.; University of Wisconsin, Madison, Wis.; American National Red Cross, Detroit, Mich.; and Topographic Engraving Co., Washington, D. C.; and the money received in payment for the work, amounting to \$482.18, was turned into the Treasury of the United States to be credited to miscellaneous receipts. On requisition of the Government Printing Office, 228 transfer impressions were made and shipped to contracting printers. Under cooperative agreements transfer impressions were furnished without charge to the State geological surveys of Wisconsin, Illinois, Virginia, and West Virginia. Transfer impressions were also furnished to the water-resources branch, Treasury Department, Massachusetts Institute of Technology, and Griffin & Co., London, England.

A large amount of miscellaneous work relating to the map publications was also done, including index circulars and lists of geologic folios, topographic maps, and State maps.

Of contract and miscellaneous printing of all kinds, 3,524,689 copies were printed. Including topographic maps and geologic folios, a grand total of 4,243,769 copies were printed and delivered during the year, an increase of nearly 10 per cent over the number in the previous year.

PHOTOGRAPHIC LABORATORY.

The output of the photographic laboratory consisted of 10,210 negatives, of which 1,147 were wet, 2,596 dry, 378 paper, 5,221 field negatives developed, and 868 lantern slides; 2,979 negatives made for photolithographers; 3,905 zinc plates; 231 zinc etchings; 109 celluloids; and 45,946 prints, of which 25,920 were maps and diagrams, 18,022 photographs for illustrations, and 2,004 rectigraphs. In addition 1,359 prints were mounted, and 93 lantern slides were colored.

ADMINISTRATIVE BRANCH.

During the year up to June 12, in addition to his technical work as one of the specialists in the division of mineral resources and as geologist, Philip S. Smith served as administrative geologist and, during the absence of the Director, as acting Director. After June 12 Mr. Smith was engaged on geologic investigations in Alaska and the duties of the administrative geologist and acting Director were performed by Marius R. Campbell. Henry C. Rizer served throughout the year as chief clerk.

EXECUTIVE DIVISION.

The work of the executive division, in charge of G. E. Mitchell, was of the same general character as during the fiscal year 1919.

Mails, files, and records.—During the year 163,343 pieces of mail, including 2,193 registered, were opened and referred; in addition 157,136 letters were received direct by the other divisions, making a total of 320,479, an increase of 4 per cent compared with 1919. Remittances received for Survey publications numbered 22,679 and aggregated \$45,109.94, an increase of 52 per cent in number of letters and of \$21,092.57 in amount compared with 1919.

The recording, referring, checking, mailing, and filing of correspondence required the services of 10 clerks. The number of letters mailed through the division was 121,980, a decrease for the year of 6 per cent. This number does not include the outgoing registered mail, which numbered 11,022 pieces, nor 180,107 pieces of letter mail sent direct from other divisions. The total for the Survey was therefore 313,109, a decrease of 21 per cent for the year. This decrease in outgoing mail can be accounted for by the fact that during the year a large part of the correspondence of the division of mineral resources was carried on in cooperation with the Bureau of the Census.

Personnel.—The roll of Secretary's appointees numbered 966 at the end of the fiscal year, 1 less than at the end of 1919. The total number of changes in the personnel was 1,217, which included 266 appointments, 267 separations (6 deaths), 643 promotions, and 41 miscellaneous changes.

During the year 17,247 days of annual leave and 5,101 days of sick leave were granted, being 73 per cent of the amount of annual leave and 21½ per cent of the amount of sick leave which is permissible under the law; 13,730 days of leave without pay were also granted.

Freight and express.—During the year 1,860 pieces of freight and express were handled, 832 outgoing and 1,028 were incoming.

DIVISION OF SCIENTIFIC AND TECHNICAL EQUIPMENT.

The cost of the work and material used in the division of scientific equipment during the year was \$26,399.

DIVISION OF ACCOUNTS.

A condensed statement covering the financial transactions of the fiscal year is given on pages 169 and 170.

Amounts appropriated for and expended by the United States Geological Survey pertaining to the fiscal year ended June 30, 1920.^a

Title of appropriation.	Appropriation.	Repayments.	Available.	Disbursements.	Balance.
Salaries, office of Director.....	\$31,020.00	.....	\$31,020.00	\$26,800.89	\$4,219.11
Salaries, scientific assistants.....	29,900.00	.....	29,900.00	29,899.99	.01
Skilled laborers, etc.....	15,080.00	.....	15,080.00	15,080.00	.....
Gaging streams, etc.....	175,000.00	\$28,009.06	203,009.06	191,245.08	11,763.98
Chemical and physical researches	40,600.00	160.84	40,160.84	33,884.42	6,276.42
Preparation of illustrations.....	18,280.00	15.00	18,295.00	18,228.40	66.60
Mineral resources of the United States.....	110,000.00	324.06	110,324.00	104,960.79	5,363.21
Geologic maps of the United States.....	118,000.00	123,115.49	241,115.49	198,886.38	42,235.11
Books for the library.....	2,000.00	.....	2,000.00	1,400.89	599.11
Topographic surveys.....	325,000.00	267,827.77	592,827.77	582,120.43	10,707.34
Geologic surveys.....	347,073.50	2,910.96	349,984.46	331,760.67	18,223.79
Mineral resources of Alaska.....	75,000.00	650.00	75,650.00	63,116.17	12,533.83
Enlarged and stock-raising homesteads.....	175,000.00	513.92	175,513.92	166,127.23	9,386.69
	1,461,353.50	423,527.04	1,884,880.54	1,763,505.34	121,375.20

^a In addition to these appropriations \$125,000 for Survey publications was contained in the appropriation for printing and binding but not disbursed by Survey officials.

^b The larger part of this balance will be used to pay outstanding obligations.

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1920.

Appropriation.	Total.	Salaries and wages.	Transportation of persons and things.	Provisions; subsistence and support of persons.	Forage; subsistence and support of animals.	Printing, engraving, lithographing, etc.
Salaries, office of Director.....	\$26,800.89	\$26,800.89	.....	.....	.....	.....
Salaries, scientific assistants.....	29,899.99	29,899.99	.....	.....	.....	.....
Skilled laborers, etc.....	15,080.00	15,080.00	.....	.....	.....	.....
Gaging streams, etc.....	191,245.08	150,744.04	\$9,190.25	\$3,527.89	\$23.90	\$583.64
Chemical and physical researches.....	33,884.42	25,865.33	561.96	1,030.32	.....	.....
Preparation of illustrations.....	18,228.40	17,933.33	.31	.....	.....	.....
Mineral resources of the United States.....	104,960.79	98,107.81	1,414.53	2,000.44	.....	.....
Geologic maps of the United States.....	198,886.38	153,534.60	69.27	89.60	.....	.....
Books for the library.....	1,400.89	.....	.....	.....	.....	.....
Topographic surveys.....	592,120.43	360,783.70	29,897.49	109,051.02	13,770.52	1,047.14
Geologic surveys.....	331,760.67	281,259.14	9,495.45	16,274.18	2,626.14	.....
Mineral resources of Alaska.....	63,116.17	47,878.48	6,426.21	4,455.04	169.59	.....
Enlarged and stock-raising homesteads.....	166,127.23	117,151.11	5,956.44	20,168.15	.....	.....
	1,763,505.34	1,323,988.42	62,511.91	161,596.64	16,590.15	1,630.78

Classification of expenditures by the United States Geological Survey pertaining to the fiscal year ended June 30, 1920—Continued.

Appropriation.	Special and miscellaneous service.	Materials; miscellaneous supplies, etc.	Stationery, drafting, etc., supplies.	Equipment (including live stock).	Maintenance, operation, and repair of passenger-carrying vehicles.	Hire of motor-propelled and horse-drawn passenger-carrying vehicles.
Gaging streams, etc.....	\$5,888.78	\$1,298.41	\$1,157.60	\$12,301.60	\$993.43	\$535.45
Chemical and physical researches.....	570.54	1,211.17	321.61	3,123.65	1,119.84	75.00
Preparation of illustrations.....	183.34	9.96	82.66	18.80	.....	.....
Mineral resources of the United States.....	1,935.34	6.59	201.66	1,128.73	.....	165.60
Geologic maps of the United States.....	3,067.74	10,406.80	27,855.33	4,837.04	.....	.....
Books for the library.....	.....	.....	.....	1,400.89	.....	.....
Topographic surveys.....	20,208.51	5,062.45	1,844.89	23,010.10	6,862.55	2,142.06
Geologic surveys.....	8,152.74	795.58	1,041.41	7,538.75	2,818.72	1,758.56
Mineral resources of Alaska.....	2,714.41	237.37	296.31	938.76	.....	.....
Enlarged and stock-raising homesteads.....	1,367.79	45.02	671.17	16,006.32	4,694.93	66.30
	53,109.19	19,073.35	33,472.64	70,306.73	16,479.47	4,743.06

LIBRARY.

The accessions of books, pamphlets, and maps numbered 13,644 items. The recorded loans were 6,403 books and 133 maps, not including those used by 11,358 readers who consulted the library in person. The catalogue was increased by the addition of 5,340 cards. In accordance with the cooperative cataloguing arrangement 572 title entries were furnished to the Library of Congress for printing, the proof reading for which involved 105 galleys.

The books collated and prepared for the binder numbered 971. The letters and other papers translated from foreign languages for other divisions of the Survey numbered 148.

The bibliography of North American geology for 1918 was published as Bulletin 698. The bibliography for 1919 and 1920 is in preparation. Work on the cumulated bibliography of North American geology has progressed steadily, but no date can be set for publication.

The library contains practically all the important scientific and technical publications treating of the subjects included in the Survey's work, as well as the necessary guides, bibliographic aids, and reference books.

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DEPARTMENT OF THE INTERIOR

JOHN BARTON PAYNE, SECRETARY

BUREAU OF MINES

FREDERICK G. COTTRELL, DIRECTOR

TENTH ANNUAL REPORT

BY THE

**DIRECTOR OF THE BUREAU OF
MINES**

TO THE

SECRETARY OF THE INTERIOR

FOR THE FISCAL YEAR

ENDED JUNE 30

1920



**WASHINGTON
GOVERNMENT PRINTING OFFICE
1920**

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First edition, December, 1920.

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TENTH ANNUAL REPORT OF THE DIRECTOR OF THE BUREAU OF MINES.

WASHINGTON, D. C., *October 15, 1920.*

SIR: During the year the completion and dedication of the magnificent Pittsburgh station and central laboratories of the Bureau of Mines marks an epoch in its growth. For the first time the Bureau of Mines has a suitable home and central headquarters for field and investigative work, and for this reason especially the bureau should be able to begin a period of even greater usefulness to the mining and metallurgical industries.

As regards the different divisions of the bureau, mention should be made of the general satisfaction that the work of the division of mine-rescue cars and stations has given to both the coal and metal-mining industries. Unsolicited letters of commendation have been received attesting the skill and knowledge of the personnel and the value of this service in time of mine disaster or fire.

As to the business and commercial organization within the bureau, the operation of the Government fuel yards in the District of Columbia has proved its success and money-saving value to the Government and demonstrated its help to the work of the bureau by linking up the work on coal and fuel combustion engineering with the business of advising and providing the best fuel for various Government departments.

The mining division of the bureau, in addition to its regular work of advising and assisting both the coal and metal mining industries toward better and safer practices, has assisted in the codification and adoption of improved coal-mine laws for the State of Utah, and has prepared and is putting into operation coal-mine regulations for coal leases on Government lands. In addition, new coal-mine explosives have been regularly tested and added to the permissible list of the bureau for use in gaseous or dusty mines; tests and demonstrations of better methods of protection against the dangers from coal dust and methane (gas) underground have been made in the experimental mine; and the geophone, an underground listening device developed during the war, has been further perfected and adapted for use in mines.

In metal mining, the outstanding feature has been the investigations of harmful dusts and the need for better ventilation in many of the Western metal mines. The results are helping toward adoption of modern ventilation methods at many Western metal mines, and thus greatly promoting healthful working conditions for miners.

In the fuel division, cooperative work with outside agencies has enabled the division to make twofold use of the money appropriated for it, and the results are leading to the saving and the more efficient use of fuel, a saving that exceeds many times the money invested by the bureau. This division also concerns itself with mechanical and electrical machinery and apparatus in and around mines, and has prepared model laws for the use of electricity underground. These laws are a milestone in the progress being made in broadening the use of electricity underground and thereby cutting down mining costs without increasing accident hazards. Further, the development of underground storage-battery locomotives has justified the preparation by the bureau of a schedule of tests. Locomotives that pass these tests by the bureau will be approved by it for use in gaseous mines.

In the division of mineral technology the production of mesothorium as a substitute for radium for certain commercial uses has been accomplished, and researches on the use of special steels have brought decided results that will promote greater use. The progress toward the production of helium on a commercial scale in cooperation with the War and the Navy Departments has been marked.

Public interest in the petroleum industry continues unabated, and the continued development of the industry is a marvel. In its work of assisting development and conservation in this industry the bureau has codified leasing and operating regulations for oil and gas lands in the public domain. So-called "peg models" have been completed, and demonstrated to producing companies in the field, and have proved their application in determining the depths to which oil wells should be bored. Through the Secretary of the Interior the bureau has assisted in bringing together natural-gas producers, consumers, and State commissioners with the hope of being able to conserve and prolong the life of this great natural asset. A continuing work of great practical value has been the study of the prevention of evaporation losses in the production, storage, and distribution of petroleum, which is resulting and will result in the saving of gasoline. Put into general use these methods will save each year millions of gallons of gasoline.

During the year the eight experiment stations distributed throughout the country continued their work on local and general mining and metallurgical problems.

The Alaska station has been of especial aid in helping to solve the variety of problems that arise under the peculiar conditions there.

The principal completed work of the Northwest station at Seattle has been the proving of the feasibility of reclaiming coal from local culm piles and putting this process into commercial use.

The Pacific station at Berkeley, Calif., has solved problems connected with the dead burning of magnesite—an advance that helps to make American magnesite products able to compete successfully with those imported.

In the Southwest station at Tucson, Ariz., marked progress has been made in devising processes for treatment of low-grade copper ores heretofore not treated.

The Intermountain station at Salt Lake City has given most of its time to devising processes for the treatment of low-grade lead and zinc ores.

At the Golden, Colo., station the radium and molybdenum work has been completed, and there has been prepared for publication a monumental work on methods of analyses and recovery of rare metals.

At the North-central station at Minneapolis there has been a continuing study of the problems of the chemical equilibrium of the blast furnace.

At the Central district station at Urbana a process has been perfected and put into actual practice whereby Middle-West low-grade coals are being used in certain city water-gas plants instead of the more expensive eastern cokes heretofore used.

At the ceramic station at Columbus the fact has been established that American bond clays can be used with as good effect in the manufacture of crucibles as imported bond clays. Furthermore, a method has been devised for the purification of white-china clays.

At the petroleum station at Bartlesville, Okla., a continuing contact has been established with oil producers and refiners in the many Southwest oil fields, and different improvements and suggestions as outlined in the body of this report have been carried out in commercial practice.

At the Pittsburgh station the principal research results have been the determination of the constitution of coal; a discovery of what causes rifle-barrel corrosion and the manner of preventing corrosion, and the continued development of the Army gas mask for commercial uses.

Through a cooperation with the New York and New Jersey Tunnel Commissions complete determination has been made of the amount and character of the poisonous gases given off by automobile

exhausts; their effects and dangers in vehicular tunnels established; and remedies have been suggested.

A further accomplishment of the year has been the obtaining of a more complete knowledge of the forms of sulphur in coal and possible lines of attack tried out leading to its elimination.

During the past few years the bureau has been building up investigative work with outside cooperating agencies in a manner unique among Federal bureaus. The detailed agreements entered into differ among themselves, but the fundamentals are these:

1. Some State, or university, private or semiprivate organization has problems in mining or metallurgy the solution of which would benefit itself and the public.

2. These outside agencies agree to pay part or all of the cost, both in personnel and materials, of the investigation, which is to be carried on under the direction of and according to the methods of the Bureau of Mines.

3. The Bureau of Mines retains the right to make public and print the results of all such investigations.

So successful has this method of solving problems been that at present the bureau has cooperative agreements with State agencies in 11 States, with 12 different universities, and with 19 private and semiprivate agencies. And the total amount of money being spent by the outside agencies on these cooperative agreements, mostly under direction of the bureau, has amounted to approximately half a million dollars during the present fiscal year. In addition, a number of representative concerns in leading mining and metallurgical industries have appropriated money to be spent under the direction of the Bureau of Mines in production of educational motion pictures illustrating various mining and metallurgical industries. The bureau has found that these films are in great demand by the public, and that they have materially assisted the wide dissemination of information concerning the industries.

Finally, the bureau is back to a peace basis, devoting its time wholly to the needs of the industries it serves. Its work must grow and develop in proportion to the value placed on its services by those industries.

Respectfully yours,

FREDERICK G. COTTRELL,
Director Bureau of Mines.

THE SECRETARY OF THE INTERIOR.

SCOPE OF ACTIVITIES.

The act (37 Stat., 681) establishing the Bureau of Mines authorizes the bureau to conduct investigations designed to improve health and safety in the mineral industry, and to promote efficient development and utilization of mineral resources. The field of the bureau's activity, therefore, extends from the commercial development of mineral deposits to the production and utilization of the marketable product.

During the past fiscal year the bureau has given special attention to aiding the mineral industries in the transition from war to the normal activities of peace. Many industries whose volume of business had increased enormously during the war, or which had been established to supply commodities needed for military use, or to replace imports cut off by the war, found themselves in a precarious condition. The bureau has sought to point out ways and means for producers of minerals and mineral products to establish themselves on a safe business basis in order to be able to meet renewed foreign competition and the changed conditions of supply and demand.

The bureau has conducted special investigations relating to new methods of producing mineral substances, and has gathered and disseminated information in regard to sources of supply of economic minerals.

It has continued to study mine hazards, rescue and first-aid training for miners, health and safety conditions in mines and mining communities, explosives and equipment used in mines, the utilization of coal with greater efficiency, the prevention of waste in the production, transportation, and use of petroleum and natural gas, and the development of processes whereby deposits of minerals now unworked may be made available as sources of supply.

In the course of its work the bureau has cooperated with the War Department, Navy Department, the Department of Agriculture, the Emergency Fleet Corporation, the Bureau of Standards, the United States Public Health Service, with the other bureaus of the Department of the Interior, and with various State and private organizations.

COOPERATIVE AGREEMENTS.

In its endeavor to obtain the most effective action with State agencies seeking the improvement of efficiency and the lessening of accidents in the mineral industries, the Bureau of Mines, with the approval of the Secretary of the Interior, has made cooperative agreements with State organizations and with State universities and mining schools.

In the past fiscal year investigations as outlined were conducted under the terms of cooperative agreements with the universities, mining schools, and State organizations named below:

University of Arizona, Tucson, Ariz.—Improvement of conditions in the mining, quarrying, metallurgical, and miscellaneous mineral industries, with special reference to the treatment of low-grade copper ores.

Industrial Accident Commission of California.—Improvement of conditions in mining, quarrying, metallurgical, and other mineral industries, safeguarding life among employees, and preventing unnecessary waste of resources.

University of California, Berkeley, Calif.—Improvement of conditions in mining, quarrying, metallurgical, and other mineral industries, with special reference to quicksilver and the precious metals.

University of Idaho, Moscow, Idaho, and the Idaho Bureau of Mines and Geology.—Investigations aimed at improving conditions in the mining, quarrying, metallurgical, and other mineral industries, with special reference to the losses that take place in the mining and milling of lead and zinc ores, safeguarding life among employees, and preventing unnecessary waste of resources.

Colorado School of Mines, Golden, Colo.—Recovery of values from rare metals and from low-grade and complex ores.

Engineering experiment station of the University of Illinois, Urbana, Ill., and Illinois Geological Survey.—Study of coal-mining methods, means of promoting the safety of coal miners, and methods of utilizing coal.

University of Minnesota, Minneapolis, Minn.—Improving conditions in the mining, quarrying, metallurgical, and other mineral industries, especially in connection with the mining and concentration of iron and manganese ores, safeguarding life among employees and preventing unnecessary waste of resources.

New York Bridge and Tunnel Commission and the New Jersey Interstate Bridge and Tunnel Commission.—Investigations with reference to exhaust gases of motor vehicles and the physiological effects of carbon monoxide gas.

State of Oklahoma.—Investigations with a view to improving conditions in the oil industry by safeguarding life among employees and preventing unnecessary waste of resources.

Ohio State University, Columbus, Ohio.—Increased efficiency in the utilization of mineral substances necessary to the ceramic industry, stimulating and upbuilding this industry and substituting ceramic products of American manufacture for those now imported.

Oregon Bureau of Mines and Geology.—Improvement of conditions in the mining, quarrying, metallurgical, and other mineral industries, safeguarding life among employees, and preventing unnecessary waste of resources.

Industrial Commission of the State of Utah.—Methods of mining that relate to health, sanitation, and safety conditions, and the appliances best adapted to prevent accidents in mines, mills, and smelters; the improvement of conditions affecting health and safety in mining, milling, and smelting; improvements in the use of explosives and electricity in such operations; inquiries and investigations relating to health, sanitation, and safety in the mining and metallurgical industries, and the obtaining of prompt and reliable reports of accidents to persons in such industries.

State School of Mines of the University of Utah, Salt Lake City, Utah.—Recovery of valuable minerals from low-grade and complex ores, the prevention of waste and the increase of efficiency in the preparation, treatment, and utilization of mineral substances.

University of Washington, Seattle, Wash.—Improvement of conditions in the mining, quarrying, metallurgical, and other mineral industries, with special reference to mining and preparation of coals, dressing low-grade ores, and electrometallurgy; safeguarding life among employees, and preventing unnecessary waste of resources.

ACCOMPLISHMENTS OF THE YEAR.

Following is a brief outline of the work accomplished by the bureau during the year:

During the year trained 10,177 miners in first aid and mine rescue methods at the mine safety cars and stations, as compared with 9,781 in the fiscal year 1919.

Rendered assistance at 27 mine accidents, 17 at coal mines, and 10 at metal mines.

Cooperated with the Army and Navy in work on the recovery of helium from natural gas.

Distributed several million pounds of surplus explosives allotted by the War Department to different branches of the Department of the Interior for use in road building and other work.

Inspected and analyzed fuels purchased by the United States Government.

Conducted tests of electrical mining equipment, including coal-cutting machines, storage-battery locomotives, shot-blasting units, and electric miners' lamps, with regard to safety devices and permissibility for use in gaseous coal mines.

Worked on the preparation of leasing regulations for coal lands on the public domain.

Investigated the standardization of coals for the export trade.

Collected information on methods of coal mining throughout the United States for a monograph showing mining practices employed in the several districts.

Investigated coal mine fires and explosions, with a view to making recommendations that will lessen explosion and fire hazards.

Continued tests of the explosibility of coal dust from different mines, as well as testing the explosibility of industrial dusts, such as zinc dust and sulphur dust.

Continued investigations of ventilation in metal mines of the West, of rock dust in metal mines, and of high temperatures and humidity in relation to their effect on the miner's health.

Studied use of underground loading machines in mines throughout the country.

Continued an investigation of methods of timbering in metal mines.

Prepared for publication a report on the use of liquid oxygen explosives in Germany during the war, and continued experiments with a view to determining the suitability of such explosives for mining work in this country.

Conducted for the Army and Navy an investigation of coal, metal, and salt mines with a view to their suitability for the storage of helium obtained from natural gas.

In cooperation with the New York and New Jersey State Tunnel Commissions, determined the composition of exhaust gases from motor vehicles, and the probable vitiation of tunnel air by such gases.

Conducted experiments on the washing of Illinois coals with a view to the improvement of quality and the removal of sulphur.

Studied the occurrence and distribution of sulphur in coal.

Studied methods and made tests in the coal-washing plants of the State of Washington with a view to improving methods in use.

Prepared a comprehensive bulletin on recent developments in the brass-furnace industry.

Conducted experiments on the recovery of potash from the alunite ores of Utah.

Began an investigation of slate quarrying with a view to increasing the efficiency of quarry methods and reducing waste of slate.

Collected information on methods of preparing talc and soapstone.

Continued an investigation of volatilization methods for extracting lead, gold, and silver from low-grade and complex ores.

Investigated methods of leaching the low-grade copper ores of Arizona.

Continued a study of the chemical and physical properties of radium and radium products.

In cooperation with the State of Colorado, made a general survey of the complex and low-grade ores of that State, with a view to determining the extent of such ores and the best methods of treatment.

Continued to investigate methods of mining and treating the low-grade iron ores of the Lake Superior district, and began experiments on the smelting of low-grade ores in an experimental blast furnace.

Conducted tests of use of coke as a house-heating fuel.

Conducted experiments on the concentration and flotation of the ores of molybdenum, vanadium, and quicksilver.

Continued a study of the physical and chemical principles underlying the recovery of minerals by the flotation process.

Cooperated with the ceramic department of the University of Washington in an investigation of the clays of that State.

Investigated practice at water-gas plants in the Middle West, with a view to the utilization of local bituminous coals as a generator fuel.

Continued cooperative work for the Navy on the preparation of special alloy steels.

Conducted an investigation, in cooperation with the State of Utah and the city of Salt Lake, of smoke conditions and the abatement of smoke in Salt Lake City.

Prepared plans for an experimental plant at New Salem, N. Dak., where the bureau will study methods of carbonizing lignite.

Investigated safety devices for mine hoists, cages, shafts, ladders, and stairways.

Assisted in preparing operating regulations to protect oil and gas leases on Government lands from waste and damage in drilling and development..

Cooperated with the National Committee on Gas in formulating measures intended to conserve supplies of natural gas by more efficient methods of production, transportation, and utilization.

Gave demonstrations of ways to prevent waste of gas in the home.

Aided in revising specifications for gasoline and lubricating oil to meet changed conditions, thus making available as motor fuel millions of gallons of gasoline that would have gone into other products.

Assisted State agencies in preparing regulations for the purchase and sale of petroleum products.

Set forth in a bulletin the best methods of studying underground conditions in oil fields, and of developing oil fields most efficiently.

Advised and assisted producers in the oil fields of Oklahoma and Texas in overcoming drilling and development problems, with the result that large financial savings have been effected, and the ultimate production of the fields greatly enhanced.

Supervised investigations in Wyoming and Colorado oil fields looking to increased efficiency and economy in production methods, effecting at one well alone a saving greater than the cost of the investigative work for the year.

Prepared recommendations for correcting conditions causing waste of gas in the Monroe gas field of Louisiana.

Studied methods of increasing the ultimate recovery of oil from oil sands.

Investigated methods of testing oil, gas, and water-bearing strata in drilling for oil and gas.

Studied the underground movement of water, oil, and gas, and their rearrangement in pay sands, with a view to overcoming water troubles in wells.

Assisted certain State legislatures in revising regulations for drilling oil wells through coal beds.

In cooperation with the Bureau of Internal Revenue continued to study methods for the proper valuation of oil lands.

Gave technical advice on the condition of oil lands in the litigated area on the Texas-Oklahoma boundary.

Compiled monthly reports on the operation of petroleum refineries, showing the output of the refineries and the consumption of crude.

Studied evaporation losses of oil in storage, and showed that losses in the Mid-Continent field of more than 122,000,000 gallons a year could be largely eliminated through the adoption of feasible practices.

Conducted experiments on the cracking of heavy crude oils, and developed a process to the point where it is now ready for commercial test.

Showed that gasoline left in residual gases from compression plants can largely be recovered by further treatment of the gas in an auxiliary absorption plant.

Conducted a survey of the motor gasolines marketed in the United States, and published a report on the subject.

Definitely settled that the loss of heating value in natural gas through removal of the gasoline content is negligible.

Cooperated with the States of Utah and Colorado in experimental work on the refining of oil shales.

Investigated the causes of metal losses in the preparation of aluminum-alloy castings.

Continued experiments on the utilization of American graphites in crucibles.

Made washing and burning tests of white clays of the East in order to determine their value for ceramic uses.

Conducted an investigation of domestic magnesite and dolomite with a view to furthering their use for fire resistant brick and other products.

Investigated methods of chlorinating natural gas for the manufacture of carbon tetrachloride, chloroform, and other products.

Determined the causes of the corrosion of Army rifles after cleaning and storage.

Investigated the use of gas masks in different industries and developed methods of testing masks for permissibility.

Completed a study of the preparation, chemistry, and uses of zirconium.

ORGANIZATION.

In the early part of the fiscal year a general reorganization of the bureau was effected. This reorganization was necessary because of the increasing variety of the investigations conducted, the many changes following the war, and the need of closer coordination of the work of the experiment stations and that of the several divisions. In the present organization, investigative work is separated as much as possible from work of a purely business or administrative nature.

The investigations branch, which is under charge of the assistant director, consists of the technical divisions and the division of mining experiment stations.

The technical divisions include the division of mining, division of mineral technology, fuels division, metallurgical division, and the division of petroleum and natural gas. Throughout the year these divisions, each in charge of a division chief who reported through the assistant director to the director, continued to conduct research in their respective fields and to assign problems for investigation at the mining experiment stations.

The experiment stations are under the direction of the supervisor of stations and the assistant supervisor. The supervisor has charge of the administrative work of the stations and the coordination of work on problems assigned by the chiefs of the technical divisions, thus preventing duplication of effort and keeping the work on the various problems advancing in accordance with a well designed plan and as a harmonious whole. Each station, in charge of a station superintendent who reports through the supervisor of stations, continued to conduct investigations related to their respective fields of work.

The operations branch, which is in charge of the assistant to the director, includes the division of office administration, the division of education and information, the Government fuel yard, the division of mine-rescue cars and stations, and the division of explosives. Matters of routine office administration are in the immediate charge of the chief clerk; the other divisions are each in charge of an engineer.

General supervision of work, from the bureau's headquarters at Washington, D. C., continued under the former director, Van. H. Manning. He personally supervised the work of coordinating the investigations and the cooperative work with the War Minerals Relief Commission. Also, the director had general supervision of the work

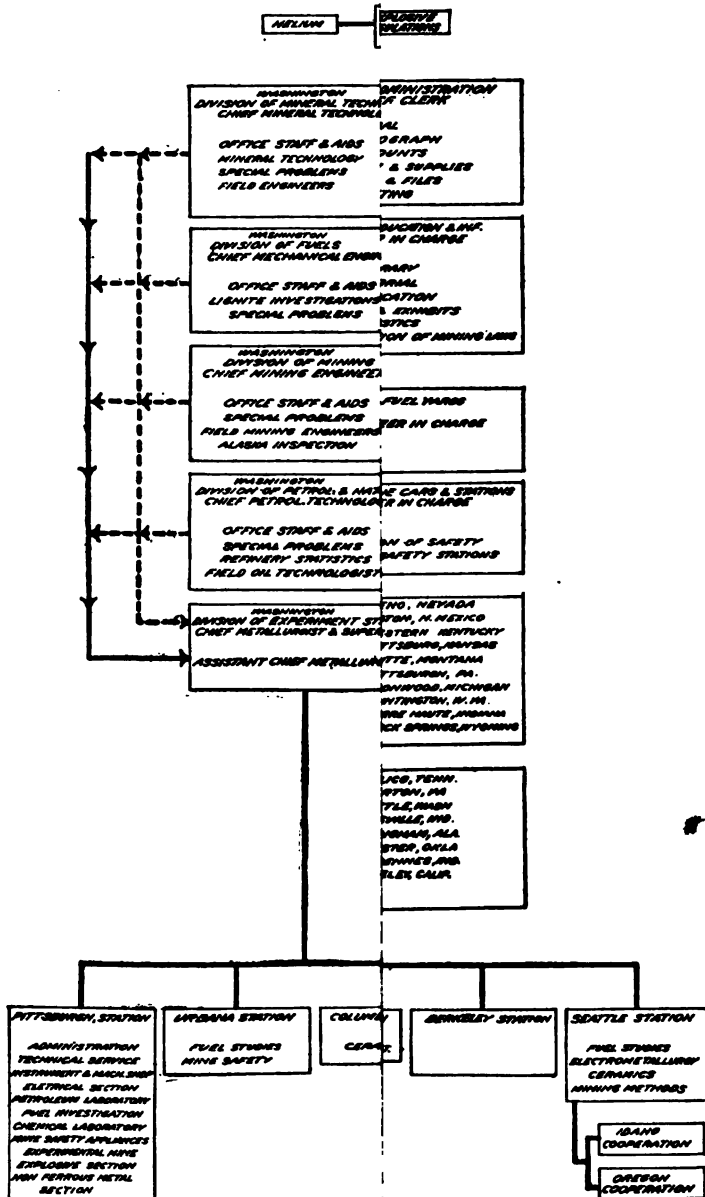
of the Federal mine inspector for Alaska and the inspection of coal mines on Indian and Government lands in Oklahoma and Wyoming.

Frederick G. Cottrell, as assistant director, was in charge of the investigations branch. Dr. Cottrell, in addition to his other duties, had general oversight of the helium investigations of the bureau. At the end of the fiscal year Mr. Manning resigned as Director of the Bureau of Mines to become director of research for the American Petroleum Institute, an association devoted to research on petroleum and natural gas. His successor, Dr. Cottrell, formally assumed charge as Director of the Bureau of Mines on June 7, 1920. Shortly after the close of the fiscal year E. A. Holbrook, who had been in charge of the Pittsburgh station, was appointed assistant director July 10, 1920.

George S. Rice, chief mining engineer, was head of the mining division; O. P. Hood, chief mechanical engineer, was head of the fuels division; C. L. Parsons, chief chemist, was in charge of the division of mineral technology until November 1, 1919, when he was succeeded by R. B. Moore. The division of petroleum and natural gas was in the charge of J. O. Lewis, chief petroleum technologist.

D. A. Lyon served as supervisor of stations, assisted by H. G. Wells, assistant supervisor. Mr. Lyon also had direct charge of the metallurgical work on major metals. The administration of the Pittsburgh station, for a time in charge of Mr. Lyon, was later placed in charge of E. A. Holbrook as superintendent. The station at Urbana, Ill., was under the direction of Mr. Holbrook until his transfer. The latter part of the year W. W. Odell served as acting superintendent. L. H. Duschak acted as superintendent of the station at Berkeley, Calif.; S. C. Lind served as superintendent of the station at Golden, Colo., succeeding R. B. Moore. C. E. Julihn was in charge of the Minneapolis station. The station at Bartlesville, Okla., was at first under the direction of W. P. Dykema, who was succeeded by W. A. Ambrose. Thos. Varley had charge of the station at Salt Lake City, Utah. F. K. Ovitz acted as superintendent of the station at Seattle, Wash., during the first part of the year; his successor was O. C. Ralston. C. E. van Barneveld was head of the station at Tucson, Ariz. R. T. Stull was in charge of the station at Columbus, Ohio; J. A. Davis was head of the station at Fairbanks, Alaska. The field office at San Francisco, Calif., was in charge of C. P. Bowie.

F. J. Bailey, assistant to the director, had supervision of the operations branch, including the work of office administration, and the educational and informational work; he gave special attention to the conduct of the mine-rescue and safety work. In addition he had general supervision of the administration of matters connected with the distribution and allotment of military explosives assigned by the War Department, and with the construction and operation of the



Government fuel yard. Matters of routine administration at the Washington office and field offices were under the immediate direction of H. E. Meyer, chief clerk. T. T. Read acted as engineer in charge of the division of education and information. D. J. Parker, mine safety engineer, with headquarters at Pittsburgh, was in charge of the division of mine-rescue cars and stations.

The organization and work of the various divisions, indicated in Plate I, is outlined in more detail below:

INVESTIGATIONS BRANCH.

MINING DIVISION.

George S. Rice, chief mining engineer, stationed at Washington, was head of the mining division, whose work is divided into four general sections: Coal-mining investigations, metal-mining investigations, explosives investigations, and special investigations.

J. W. Paul, coal-mining engineer, with headquarters at Pittsburgh, Pa., was in charge of field coal-mining investigations and of the work at the experimental mine. S. P. Howell, explosives engineer, stationed at Pittsburgh, was in charge of the physical tests of explosives. The metal-mining investigations and special work was conducted under the direct charge of the chief mining engineer.

Sumner S. Smith served as Federal mine inspector for Alaska, and continued to assist the Alaskan Engineering Commission in directing coal-mining operations at Eska and Chickaloon to provide coal for the Government-owned railway.

The mining engineers in charge of the field districts are named elsewhere.

Investigations completed or continued during the year and the officials in charge are listed below:

Industrial use of liquid oxygen explosives, George S. Rice.

Standardization of coals for export trade, Mr. Rice.

Coal leasing regulations, Mr. Rice.

Methods of storing helium in mines, Mr. Rice.

Cooperation with Navy on Alaskan coals, Mr. Rice.

Compilation of coal-sampling and coal analyses by States, Mr. Rice.

Washing tests of Illinois coals, Thomas Frazer, mining engineer.

Washing tests of Pacific coast coals, E. R. McMillan, assistant mining engineer.

Regional coal-mining methods, J. W. Paul.

Coal-mine explosion hazards, Mr. Paul.

Coal-dust explosion hazards in industrial plants, L. D. Tracy.

Coal stripping operations, Mr. Paul.

Causes and effects of subsidence from coal mining in certain districts in Illinois, C. A. Herbert and Thomas Frazer.

Study of coal mine atmospheres in Illinois and Indiana, Mr. Herbert.

Coal-mine regulations, model law for Utah, C. A. Allen.

Methods of extinguishing aluminum dust fires, Alan Leighton.

Ventilation of metal mines, Daniel Harrington, mining engineer.

Rock dust in relation to miners' pulmonary diseases, Mr. Harrington, in cooperation with surgeons of the United States Public Health Service.

High temperatures and humidity as affecting health of miners, Mr. Harrington.

Methods of prospecting and exploration of ore deposits, C. L. Colburn, mining engineer.

Investigations of underground loading machines, Mr. Colburn.

Methods of timbering in metal mines, E. A. Holbrook.

Iron-mining methods in the Lake Superior district, C. E. Julihn, mining engineer.

Ground movements in deep copper mines of the Lake Superior district, F. W. Sperr.

Tests of explosives in metal mines, Daniel Harrington.

Chemical tests of mine explosives, A. C. Fieldner.

Physical tests of mine explosives, S. P. Howell.

Neumann bands in steel, Mr. Howell.

Application of military explosives to commercial use, C. E. Munroe, and S. P. Howell.

FUELS DIVISION.

The fuels division was under the supervision of O. P. Hood, chief mechanical engineer, who was stationed at Washington, D. C.

The investigations undertaken or continued during the year and the officials in charge were as follows:

General fuel investigation, Mr. Hood.

Smoke-abatement investigation, Salt Lake City, Mr. Hood.

Combustion of powdered coal, Mr. Hood.

Removal of ash from powdered coal (Trent process), Mr. Hood.

Cooperation with Heating and Ventilation Society, Mr. Hood.

Utilization of lignite, Mr. Hood and S. M. Darling, fuel engineer.

Coking of Illinois coals, Mr. Hood.

Inspection of Government fuel, N. H. Snyder, assistant fuel engineer.

Analysis of coals purchased for the Government, H. M. Cooper, chemist.

Efficiency in the use of fuels, Henry Kreisinger, fuel engineer.

Boiler testing for the Emergency Fleet Corporation, Mr. Kreisinger.

Use of coke for house-heating purposes, Mr. Kreisinger.

Use of fuels in distillation of oils, Mr. Kreisinger.

Cooperative work with the War Department on fuel-burning equipment, Mr. Kreisinger.

Electrical equipment in mines, F. C. Ilsley, electrical engineer.

Tests of flame safety lamps, Mr. Ilsley.

Rules and regulations for use of electricity in mines and quarries, Mr. Ilsley.

Codification and study of State laws on electricity in mines, Mr. Ilsley.

Storage-battery locomotives, Mr. Ilsley.

Shot-firing units, Mr. Ilsley.

Tests of electric coal-cutting machines, Mr. Ilsley.

Mechanical equipment of mines, R. H. Kudlich, assistant mechanical engineer.

Chemical investigations of fuels, A. C. Fieldner, chemist.

Bituminous coal as fuel for water-gas sets, W. W. Odell.

DIVISION OF MINERAL TECHNOLOGY.

Dr. R. B. Moore had charge of the division of mineral technology, succeeding Dr. C. L. Parsons, who resigned on November 1, 1919. Dr. Moore had been in charge of the Golden station up to that date, and also had been devoting much of his time to superintending work on helium. L. I. Shaw was appointed assistant chief chemist in July, 1919, and has served in that capacity and as assistant chief of the division of mineral technology since that time.

Dr. Moore acts in an advisory capacity for all of the chemical work of the bureau and, as chief of the division of mineral technology, has authority over the technical work at the Columbus station, the Ithaca field office, and over the rare-metals investigations at the Golden station. He also has technical control of certain work at some of the other stations.

The investigations undertaken or continued during the year and the officials in charge are as follows:

Investigations of alloy steels, especially those containing molybdenum, zirconium, uranium, cerium, and boron, H. W. Gillett, chief alloy chemist.

Investigation of uses and methods of preparing radium, S. C. Lind, physical chemist.

Investigation of electric brass furnaces, D. Gillett.

Production of phosphor copper by electric smelting, Mr. Gillett.

Slate quarrying, O. W. Bowles, quarry technologist.

Uses of aluminum and foundry practice, R. J. Anderson, metallurgist.

Metallurgy of quicksilver, L. H. Duschak, chemical engineer.

Crucible graphite, R. T. Stull, chief ceramist.

Clays, magnesite, and dolomite, Mr. Stull.

Talc and soapstone, R. B. Ladoo, mineral technologist.

Occurrence of potash and magnesia, W. C. Phalen, mineral technologist.

Recovery of potash from ores, mill tailings, and dusts of cement plants, Mr. A. E. Wells.

Chemistry and metallurgy of platinum, vanadium, and molybdenum, Mr. Lind.

METALLURGICAL DIVISION.

During the year the work on major metals was under the direction of D. A. Lyon, as chief metallurgist. The investigations conducted during the year, and the officials in charge, are as follows:

Treatment of low-grade and complex ores in the State of Utah, in cooperation with the University of Utah, Thomas Varley, metallurgist.

Treatment of low-grade copper ores, C. E. van Barneveld.

Investigation of the flotation process, W. H. Coghill, metallurgist.

Methods of producing sponge iron, Mr. Duschak.

Methods of treating low-grade ores of Alaska, J. A. Davis, mining and ore-dressing engineer.

Methods of treating low-grade iron ores, C. E. Julihn, P. H. Royster, and C. E. Plummer.

Study of electrometallurgical methods of treating ores, F. K. Ovitz, O. C. Ralston.

Mining and milling methods for lead and zinc ores, C. A. Wright, metallurgist.

DIVISION OF PETROLEUM AND NATURAL GAS.

J. O. Lewis, chief petroleum technologist, was in charge of the division of petroleum and natural gas. The work of the division is arranged under four general heads: Production technology, engineering technology, chemical technology, and oil-shale technology. Some of the special investigations of the year follow:

PRODUCTION TECHNOLOGY.

Study of underground conditions in oil fields, A. W. Ambrose.

Study of conditions in Walters field, Oklahoma, T. E. Swigart, E. L. Sproat, and H. N. Spofford.

Study of conditions in Comanche oil and gas field, Mr. Swigart.

Study of conditions in Hewitt Field, Oklahoma, Mr. Swigart, C. E. Beecher, and F. X. Schwarzenbek.

Oil recovery problems, Mr. Ambrose and C. E. Beecher.

Perforated casing and screen pipe in oil wells, E. W. Waggy.

Casing troubles and fishing methods, Thomas Curtin.

Protection of oil and gas in Wyoming and Colorado fields, F. B. Tough, H. B. Hill, E. P. Campbell, B. H. Scott, R. R. Templeton, and W. Drake.

Conservation of natural gas in cooperation with National Committee on Conservation of Natural Gas, J. O. Lewis and Mr. Waggy.

Lectures and demonstrations on efficient use of natural gas and gas burning appliances, S. S. Wyer and Olga A. Elifritz.

Study of water conditions in the oil fields of Texas, R. E. Collom, J. B. Kerr and W. A. Snyder.

Action of water on oil and gas in underground strata, R. Van A. Mills.

Prospecting and testing oil, gas, and water-bearing strata, Mr. Collom.

Drilling regulations under leasing act of February 25, 1920, Messrs. Lewis, Waggy, Tough, and Collom.

Osage gas investigation, H. R. Pierce and W. P. Dykema.

Factors in oil production, C. H. Beal, and Mr. Lewis.

Revision of report on Boulder oil fields, Mr. Waggy.

Action of underground water on oil and gas well cementing, Mr. Mills and E. C. Lane.

Revision of regulations on drilling wells through coal seams, Messrs. Lewis and Waggy.

Study of methods of evaluating oil and gas properties and co-operative work with Internal Revenue Bureau of the Treasury Department, W. W. Cutler, jr.

Monroe gas field (Louisiana) investigation, Mr. Collom.

Report on disputed boundary Red River oil lands for Government receiver, Mr. Collom.

Collection and computation of refinery statistics, H. F. Mason.

Compilation of refineries statistics, Mr. Mason.

Bibliography of petroleum, Miss E. H. Burroughs.

ENGINEERING TECHNOLOGY.

Evaporation losses of crude oil in storage, C. P. Bowie, J. H. Wiggins, and A. R. Elliott.

Cracking of tars and heavy oils, Mr. Bowie and M. J. Gavin.

Methods of reducing viscosity of heavy asphalt base crude oils, Messrs Bowie and Gavin.

Oil-camp sanitation, Mr. Bowie.

Carbon-black investigation, R. O. Neal and G. St. J. Perrett.

Absorption of gasoline vapors from natural gas, Mr. Neal and W. P. Dykema.

CHEMICAL TECHNOLOGY.

Experimental refinery at Bartlesville, Okla., H. H. Hill.

Recovery of gasoline from still vapors, D. B. Dow.

Analytical distillation of petroleum, E. W. Dean.

Specifications for petroleum products, H. H. Hill, J. O. Lewis, N. A. C. Smith, M. S. Requa, and S. W. Gray.

Heating value of treated and untreated natural gas, Mr. Dow.

Analysis and tests of oils and products for Bureau of Mines, N. A. C. Smith, C. R. Bopp, Dr. Dean.

Cooperation with United States Shipping Board, Dr. Dean.

Crude oil survey, Dr. Dean.

Study of commercial gasoline, H. H. Hill and Dr. Dean. (Bulletin in course of publication.)

Investigations to determine substances in gasoline causing gumming and corrosion, N. A. C. Smith.

Paper prepared on improved method of determining water in petroleum, Dr. Dean.

OIL SHALE TECHNOLOGY.

Cooperative oil-shale work at Boulder, Colo., on methods of utilizing oil shales, M. J. Gavin and L. H. Sharp.

Oil shale and its economic importance, Mr. Gavin.

Oil-shale investigations, cooperative work, with State of Utah, Mr. Gavin and L. C. Karrick.

Bulletin on oil shale industry, in course of preparation, Mr. Gavin.

Cooperative oil-shale work with Southern Pacific Co. at Elko, Nev., Dr. David T. Day, consulting engineer.

NEW MINING EXPERIMENT STATIONS.

Under the terms of the act of Congress approved March 3, 1915 (40 Stat. 969), appropriation was made in the sundry civil bill, approved April 5, 1920, for the establishment of two new mining experiment stations, to be under the direction of the Bureau of Mines. One of these will be located in the Birmingham, Ala., district, the other will serve the St. Louis, Mo., district.

OPERATIONS BRANCH.

DIVISION OF OFFICE ADMINISTRATION.

During the year this division was in charge of H. E. Meyer, chief clerk. The work includes the legal section; mimeograph section; section of accounts, properties, and supplies; mails and files; drafting; personnel; and general clerical, labor, messenger, and other service work of the Washington office. The chief clerk also has supervision of the methods of office administration at all stations and branches of the bureau.

DIVISION OF EDUCATION AND INFORMATION.

T. T. Read, engineer in charge, with headquarters at Washington, supervised the work of the division of education and information. Mr. Read had responsibility for establishing contacts with other Government departments, for recommending to the chiefs of other divisions the character and scope of publications, exhibits, and other educational media, and for putting the results of investigations in the most serviceable form for publication.

He had general supervision of the editorial work, the distribution of publications, the examination and codification of mining laws, the collection of statistics of accidents and fatalities in the mineral industries, the educational work through motion pictures and exhibits, the compilation of special reports of investigations, the Bureau of Mines library, and the compiling of a reference and information file of the mining industry.

R. B. Ladoo, mineral technologist, acted as assistant to the engineer in charge until April, 1920; he was succeeded by H. E. Tuftt, mining engineer.

DIVISION OF MINE-RESCUE CARS AND STATIONS.

D. J. Parker, mining engineer, with headquarters at Pittsburgh, had charge of mine-rescue operations, the testing of mine-rescue apparatus, the training of miners in first-aid and rescue methods, and the conduct of rescue and first-aid contests.

For purposes of safety work the country is divided in nine safety districts, each with a district engineer in charge. The district engineers and their headquarters are given on page 131. The bureau maintained 10 mine-safety cars and 8 mine-safety stations distributed throughout the mining districts. The headquarters of the cars and location of the stations, with the personnel, are listed on pages 131 to 133 of this report.

The district engineers and the foremen of the cars and stations, in addition to the rescue and safety work, cooperated with the district engineers of the mining division in the investigation of specific problems assigned by the chief mining engineer.

EXPLOSIVES REGULATION.

The administrative work of the explosives regulation was under the supervision of F. J. Bailey, assistant to the director. Matters relative to technical problems were conducted by Clarence Hall, consulting explosives engineer, and Dr. C. E. Munroe, chief explosives chemist.

SPECIAL INVESTIGATIVE AND ADMINISTRATIVE WORK.**RECOVERY OF HELIUM FROM NATURAL GAS.**

Experimental development of the helium plant at Petrolia, Tex., continued throughout the year. It will be remembered that this plant is operated by the Bureau of Mines upon funds from, and in cooperation with, the Air Service of the Army and the Bureau of Steam Engineering of the Navy. The money is allotted from Army and Navy appropriations in equal proportions and the project is under the general administrative control of the Army and Navy Helium Board.

The two main difficulties encountered in this work are the poor quality of the water available for boiler feed purposes and the changes in the composition of the natural gas from which the helium is recovered. Hence, material alterations in the additions to the plant have had to be made and these are still in progress. The work is proceeding rapidly, however, and the speedy resumption of experimental operation is anticipated.

CRYOGENIC LABORATORY AT WASHINGTON.

Funds have been supplied in equal proportions from Army and Navy appropriations for the establishment of a cryogenic research laboratory for the investigation of properties of gases and liquids at low temperatures, with particular reference to the separation of helium from natural gas. The equipment for this laboratory is being assembled.

During the year the direction of the technical work incident to the helium plants has been in the hands of Dr. F. G. Cottrell, with Dr. R. B. Moore in direct charge of the cryogenic research laboratory and the helium exploration program.

WAR MINERALS RELIEF COMMISSION.

Section 5 of the act of March 2, 1919 (40 Stat. 1272), entitled "An act to provide relief in cases of contracts connected with the prosecution of the war, and for other purposes, under given conditions," authorizes the Secretary of the Interior to adjust certain losses

sustained in the production, or attempted production, of manganese, chrome, pyrites, or tungsten during the period of the war. For the execution of this provision a commission of three members, known as the War Minerals Relief Commission, was appointed by the Secretary of the Interior for the purpose of reviewing the claims and making recommendations to the Secretary, in whom final action is vested.

The members of the original commission were J. F. Shafroth, chairman, M. D. Foster, and P. N. Moore. The vacancy created by the death of Dr. Foster, October 20, 1919, was filled by the selection of H. G. Pomeroy.

The director of the Bureau of Mines is authorized to conduct examination of properties, accounting investigations, office routine, and the administrative work of the commission. Immediate supervision of the technical and examining forces has been assigned to W. R. Crane, chief engineer of the commission; the chief clerk, Sheridan Ferree, has charge of the administrative work.

During the fiscal year 1920 the commission has considered and made recommendations in 904 of the 1,203 claims filed. In 108 of these claims awards were made amounting in the aggregate to \$1,333,554.13. During this period 17 engineers and 13 auditors were in the field, engaged in examining the properties and accounts involved in the claims. The volume and character of this work necessitated the establishment of temporary headquarters at San Francisco, Calif., and Batesville, Ark. The latter office was abandoned on the completion of work in that district.

Notwithstanding the volume and the arduous character of the work involving, as it does, both technical and legal questions, the commission has been and is making every effort to expedite matters with the hope of bringing the work to an early termination.

• METAL-MINE ACCOUNTING.

During the year a paper on "Metal-mine accounting," by C. B. Holmes, of the War Minerals Relief Commission, was published as Technical Paper 250 of the bureau. It outlines a simple system for keeping correct records of costs and preserving metallurgical data, that can be used by a company even though its accountant has had no previous experience in mine accounts. Such records are indispensable to proper management, and to the compilation of tax returns; they may also furnish much information of value to the mining industry in general.

SULPHURIC ACID.

A comprehensive bulletin on the sulphuric acid industry in the United States, by A. E. Wells, is in press. This bulletin, which contains data compiled as part of the work of the war minerals in-

vestigation, discusses fully the burning of sulphur and the roasting of pyrite, the purification of the sulphur gases, and the details of the chamber and contact processes.

WORK OF INVESTIGATIONS BRANCH.

The work of the research divisions and of the mining experiment stations under the direction of F. G. Cottrell that was accomplished during the fiscal year is described in the following chapters.

WORK OF THE MINING DIVISION.

The administration of the mining division during the fiscal year was carried on under the direction of George S. Rice, chief mining engineer, stationed at Washington. The work is divided into four sections, as follows:

1. Coal mining, under the general charge of Mr. Rice. The field coal-mining investigations and the work of the experimental mine were under the direct charge of J. W. Paul, coal-mining engineer, with headquarters at Pittsburgh, Pa.
2. Metal mining, under the direct charge of Mr. Rice.
3. Explosives, under the general charge of Mr. Rice, in consultation with Dr. Charles E. Munroe, chief explosives chemist. The physical tests of explosives were under the direct charge of S. P. Howell, explosives engineer, with headquarters at Pittsburgh, Pa.
4. Special mining investigations, under the direct charge of Mr. Rice.

In addition the Federal mine inspector for Alaska serves under the chief mining engineer.

Much of the work of the mining division is described under the chapter on the work of the Pittsburgh station, pages 90 to 107.

WORK OF THE CHIEF MINING ENGINEER.

Apart from his administrative duties as chief of the division, Mr. Rice prepared a report on the industrial use of liquid-oxygen explosives in Europe, and planned the investigative work on liquid-oxygen explosives conducted at the experimental mine near Pittsburgh, Pa., and in mines and quarries; gave special attention to the matter of export coals, and their standardization; prepared a number of special reports for the information of the Secretary of the Interior on coal problems; suggested and helped plan work on the exhaust gases of motor vehicles in vehicular tunnels; prepared a paper based on personal study in Europe as a member of the Interior Department commission on German destruction in the French mines and plants and their rehabilitation; assisted in the formulation of pro-

posed administrative regulations for leasing and mining coal, phosphate, and oil shale, and prepared a draft of the operating coal regulations under the act of February 25, 1920; prepared for the Army and Navy Air Service an estimate of the cost of storage of helium in mines, directed the storage experiments at the experimental mine near Pittsburgh, and had a survey made of mining regions for suitable underground places for storage of helium; prepared for the information of the Navy Department and at the request of the Assistant to the Secretary of the Interior, a special report on Alaskan coal developments.

WORK OF ASSISTANT TO THE CHIEF MINING ENGINEER.

C. L. Colburn, mining engineer, acted as assistant to Mr. Rice in handling the work of the mining division at Washington, and helped to coordinate and direct the work of the division and its field engineers; was a member of the engineers' advisory committee to the Reclassification Commission in the reclassifying of engineers; collected information for a bulletin on "Methods used in prospecting and exploration"; collected data on underground loading devices; and made examinations in the interest of increased safety in mines.

MINE INSPECTION IN ALASKA.

Sumner S. Smith, Federal mine inspector for Alaska, in addition to the work of inspecting metal and coal mines of the Territory, supervised the operations of the Eska mine and the Chickaloon mine in the Matanuska field, Alaska, where coal is being mined by the Alaskan railway commission for use on the Alaskan Railway. He also prepared plans for a proposed washing plant for the raw coal, which is high in ash.

COAL-MINING INVESTIGATIONS.

STANDARDIZATION OF COAL FOR EXPORT TRADE.

The chief mining engineer made a special study of conditions in the coal industry in connection with export matters, especially as regards the standardization of American coal for export. He prepared a paper on standardization of coal for the export trade which he read before the American Mining Congress in St. Louis in November, 1919, and wrote an article on the coal situation which was published in the Mining Congress Journal. He attended a meeting of the coal export committee in New York on October 28, 1919, called to consider the export situation, and also attended a meeting of the International Trade Conference at Atlantic City, N. J. He also prepared an article on comparison of British and American coal-mining conditions.

COOPERATIVE WORK IN THE PREPARATION OF REGULATIONS FOR MINING
LEASES ON GOVERNMENT LAND.

The leasing bill (Public 146) enacted by Congress February 25, 1920, changed the former policy of the Government regarding the disposal of millions of acres of coal, phosphate, oil, gas, and sodium on the public domain. The reason for this is indicated by the general provisions which call for regulations to be made by the Secretary of the Interior to obtain (1) reasonable diligence, skill, and care in the operation of said property in accordance with improved methods and practice; (2) the prevention of undue waste; (3) the safety and welfare of miners; (4) insuring the fair and just measurement of coal minings by such miners.

The Bureau of Mines was asked to help prepare leasing forms and general leasing regulations in conjunction with the Land Office, and specifically to prepare operation regulations.

Operating regulations for Government oil and gas leases were formulated by the petroleum division of the bureau with the assistance of national petroleum and gas associations and representatives of governors of the States which included the public domain. These regulations were approved by the Secretary of the Interior.

Coal-leasing regulations are being prepared by the mining division of the bureau. Conferences were held with representatives of national coal-mining societies and representatives of governors of coal-bearing public-domain States. These regulations are necessarily more complicated than those for petroleum and gas, and have to take into account, by the provisions of the leasing act, not only the methods of mining the coal, but the health and safety of the employees. It is expected that these regulations will be submitted to the Secretary in the near future.

ALASKAN COALS FOR NAVAL USE.

Mr. Rice furnished information to the Navy Department commission charged with the development of coal mines in the Matanuska field, Alaska, to produce coal for the use of the Navy, and he prepared a special report on the Eska and Chickaloon coal mines in the Matanuska field. Specifications were furnished for suitable coal-washing machinery and recommendations for procedure were formulated.

COAL SAMPLING AND ANALYSIS, SERIES BY STATES.

The chief mining engineer drafted a plan for the compilation of analyses of mine and car samples of coal collected by the Bureau of Mines and the United States Geological Survey into groups of coal-mining States or individual States. A technical paper on

"Analyses of Iowa Coals" was prepared as a model. When the series of papers is published an inquiry with regard to the coal of a certain State can be answered by sending a copy of the paper containing the analyses instead of a bulletin containing analyses from many States, as in the past. J. W. Paul and all the district engineers in the coal regions assisted in this work.

FIELD COAL-MINING INVESTIGATIONS.

REGIONAL COAL-MINING METHODS.

Methods employed in mining coal in Alaska, Kansas, Oklahoma, Pennsylvania, Washington, and Oregon were studied with a view to determining the waste in coal mining, and of suggesting methods for increasing the amount of recovery. A monograph on the mining practices in all the coal-mining districts of the country is in preparation. This work was conducted by J. W. Paul, assisted by L. D. Tracy, W. B. Plank, C. A. Herbert, and J. J. Rutledge.

COAL-MINE EXPLOSION HAZARDS.

Detailed investigations of coal-mine explosions and accidents at various mines during the year were made by J. W. Paul, assisted by the district and the field engineers. Reports were furnished to the mine owners with recommendations for obtaining greater safety. Reports on coal-mine explosions are being abstracted, studied, and compared, with a view of making recommendations that will lessen disasters.

COAL-DUST EXPLOSION HAZARDS IN INDUSTRIAL PLANTS.

L. D. Tracy investigated coal-dust accumulations in industrial plants in Ohio and Pennsylvania, and the explosibility of the dusts was tested. A report of these investigations was submitted by Mr. Tracy.

COAL-STRIPPING OPERATIONS.

Data collected by studies of coal-stripping operations are being assembled for publication. This work is being done by J. W. Paul and the field engineers of the division.

OTHER COAL-MINING INVESTIGATIONS.

The bureau has made a study of the causes and the effects of subsidence from coal mining in certain districts in Illinois, monuments being established and relative elevations determined by survey from time to time. Study has also been made of coal-mine atmospheres in Illinois and Indiana, and has rendered assistance to officials of the State of Utah in preparing coal-mine regulations.

In addition investigations were made at the Gebo Mine in Wyoming, of "bumps" in coal mines in the State of Washington, and of accidents in the use of powdered fuel. Information was collected on the effectiveness of "guniting" with the "cement gun," and of asphalt cement, in stopping the slacking of coal-mine roofs. The investigation of fires in coal mines was continued for the purpose of obtaining information on the origin and the methods of control and extinguishing. Reports on fires in coal mines are being abstracted preliminary to recommending methods of eliminating mine fires.

As in previous years the bureau has cooperated with the Office of Indian Affairs in furthering the use of permissible explosives and improvements in methods of mining in coal mines on the Indian lands in Oklahoma. J. J. Rutledge, district mining engineer, acts as the bureau's representative. Mr. Rutledge also served on an official commission for valuing the segregated coal lands sold at public auction. Most of the valuable coal lands have been sold in this way, on a five-year installment basis; the title does not pass until final settlement, and Government supervision meanwhile continues.

COAL WASHING.

Work on problems in coal washing has been conducted at the mining experiment stations at Urbana, Ill., and Seattle, Wash., and is fully described under the accounts of those stations.

EXPERIMENTAL MINE.

During the year the experimental mine at Bruceton, Pa., has been utilized for tests of the explosibility of coal and other dusts, tests of liquid-oxygen explosives, and tests of methods of storing helium. J. W. Paul, chief of coal-mining investigations, is in charge of the mine.

EXPLOSION TESTS IN THE EXPERIMENTAL MINE.

In studying the explosibility of coal dust and the speed of propagation of such explosions studies were made, and a number of tests were run. Work on the development of methods for the prevention of explosions was continued. Extensive explosion tests were made of coals from mines in Illinois, Alabama, and New Mexico. Tests were made of a type of coal-dust barriers in cooperation with coal-mining operators in Illinois.

The above work was done by a number of engineers working under Mr. Paul.

LABORATORY WORK ON EXPLOSIBILITY OF DUSTS.

A large number of explosibility tests of coal dusts and other dusts were made in the Pittsburgh laboratory. Among these, a series of tests on the inflammability of grain dusts in comparison with coal

dusts were made in cooperation with the Bureau of Chemistry. The results indicate that grain dusts are more inflammable than Pittsburgh coal dust. In addition, a series of tests were conducted to determine the inflammability of zinc dust and the fire hazard during shipment on boats. Rough determinations were made of the explosive limits of sulphur dust, the explosibility of gilsonite, and of oil shale, and many laboratory tests were made paralleling the explosion tests in the experimental mine. These tests were under the direction of J. W. Paul, Alan Leighton, and H. L. Lentz.

METHODS OF EXTINGUISHING ALUMINUM DUST FIRES.

Experiments with various substances, including patented preparations, indicated that of the substances tested sodium chloride could be most successfully used in extinguishing aluminum dust fires. These experiments were made by Alan Leighton.

OTHER WORK AT EXPERIMENTAL MINE.

The staff of the experimental mine was employed also in connection with the demonstration of the explosibility of coal dust in the wooden gallery at Forbes Field during the national first aid and mine rescue meet in September, 1919. Subsequently work was done on the development of a method of igniting coal-dust clouds in open air for demonstration purposes.

Chambers were prepared underground to determine methods of storing gas under high pressure, with the special view of storing helium. Concrete-lined and copper-lined constructions were made, and a high-pressure compressor was installed, for subsequent testing as planned by Mr. Rice and carried out under the direction of Mr. Paul.

METAL MINING.

INVESTIGATIONS OF VENTILATION AND DUST CONDITIONS IN METAL MINES.

This problem is so important that many of the bureau's mining engineers in the West have concentrated their efforts on it, and investigations will be conducted in some of the principal metal-mine camps. Daniel Harrington, supervising engineer of the western districts, is in charge.

METHODS OF PROSPECTING AND EXPLORATION.

During the year C. L. Colburn continued to gather data for a paper on methods of prospecting and exploration.

INVESTIGATIONS OF UNDERGROUND LOADING MACHINES.

Mining engineers of the bureau have investigated all the underground loading machines in actual use in mines throughout the country. The data are now being assembled by Mr. Colburn for publication.

METHODS OF TIMBERING IN METAL MINES.

A study of methods of timbering in metal mines has been continued and a report has been submitted. This work was done by E. A. Holbrook and R. V. Ageton.

IRON-MINING METHODS IN THE LAKE SUPERIOR DISTRICT.

C. E. Julihn is making a study of iron-mining methods in the Lake Superior district.

GROUND MOVEMENTS IN THE DEEP COPPER MINES OF THE LAKE SUPERIOR DISTRICT.

F. W. Sperr, of the Michigan College of Mines, assisted by R. V. Ageton, has begun a study of ground movements in the deep copper mines of the Lake Superior district.

DEVELOPMENT OF LIQUID-OXYGEN EXPLOSIVES DURING THE WAR.

During his trip to Europe in 1919 as a member of the Department of the Interior commission to investigate methods of rehabilitation of French mines and plants destroyed in the war, Mr. Rice investigated the possible industrial application in this country of liquid-oxygen explosives such as had been used by the Germans.

Mr. Rice afterwards reported his findings in Technical Paper 243. Research on the methods of making and utilizing liquid-oxygen explosives which had been started at the Pittsburgh station of the Bureau of Mines when the United States entered the war has been resumed. The work has demonstrated that the use of liquid oxygen as an explosive is feasible, but that the cost and the difficulty of introducing a new method of blasting postpone its application. Recently the prospect of cheaper methods for making liquid oxygen have brightened the outlook for its introduction. The testing of liquid oxygen at Pittsburgh, previously conducted by S. P. Howell, during the past fiscal year was carried on by Alan Leighton under the supervision of J. W. Paul.

TESTS OF EXPLOSIVES IN METAL MINES.

Several serious metal-mine fires have been caused by blasting timbers with dynamite. It is expected to study and make tests of permissible explosives in metal mines to determine whether this fire

hazard can not be overcome. The problem has been assigned to Daniel Harrington and J. J. Forbes.

CHEMICAL TESTS OF MINE EXPLOSIVES.

Results of chemical tests of mine explosives, which are conducted under the direction of A. C. Fieldner, chemist, at the Pittsburgh station, are described under the work of that station (p. 98).

PHYSICAL TESTS OF MINE EXPLOSIVES.

Physical tests of mine explosives are made at the explosives experiment station near Bruceton, Pa. The testing work is in direct charge of S. P. Howell, explosives engineer, and under the general charge of the chief mining engineer. Besides the work on routine testing of permissible explosives, work was done in various special investigations. Also, six explosions caused by explosives were investigated.

A description of this work will be found under the account of the Pittsburgh station (p. 91).

SPECIAL INVESTIGATIONS.

FOREIGN INVESTIGATIONS.

In February, 1919, Mr. Rice went as a member of the Interior Department commission to study methods of rehabilitation of the mines in Allied establishments in the destroyed areas of France and Belgium, to observe the coal and iron situation in Europe resulting from the war, and to study European methods of mining coal, iron, and potash. He acted as adviser to members of the economic section of the American peace commission and the American delegates to the economic conference with the Germans at Cologne in April, 1919. A survey of his conclusions drawn from his study of French and Belgian mines was published in the June, 1920, issue of the Journal of the Franklin Institute.

HELIUM STORAGE.

Calculations were made and estimates submitted by the chief mining engineer to the Army and Navy Air Services on the cost of storing helium in mines, this being probably the cheapest and most permanent method of storage, under an allotment made to the bureau by the air services of the Army and the Navy. Underground chambers of special construction, and compression machinery, were installed or contracted for at the bureau's experimental mine near Bruceton, Pa., with a view to testing in the near future. Field investigations were made of the suitability of several kinds of mines—

coal, metal, and salt—for the storage of helium. A report on progress is being prepared, but experiments will be necessary in order to reach definite conclusions.

AUTOMOBILE EXHAUST GASES IN VEHICULAR TUNNELS.

The rapidly increasing use of motor vehicles and trucks has made proper ventilation of long vehicular tunnels and subways a matter of serious importance. Twin tunnels 8,000 feet long are being designed to pass under the Hudson River between New York City and New Jersey. Another pair of tunnels at Pittsburgh, Pa., 5,700 feet long through the South Hills are under construction; and a tunnel 6,000 feet long between Boston and East Boston is proposed. The ventilation of such tunnels is important because carbon monoxide contained in exhaust gases from motor vehicles is poisonous, yet through proper dilution and sweeping away by an adequate air current, the gases can be made harmless. No new principles are involved, but it is necessary to know exact limitations for proper design.

As a result of conferences of Clifford M. Holland, chief engineer of the New York and New Jersey State bridge and tunnel commissions, and Dr. Edward Levy, medical director, with the chief mining engineer of the bureau, and later with the director and the supervising chemist, a cooperative arrangement was entered into by the commissions and the Bureau of Mines to investigate the physiological effects of exhaust gases of automobiles and trucks in the confined space of a tunnel. The inquiry involved two lines of investigation:

1. The amount and composition of the exhaust gases given off by different types of cars and trucks.
2. The amount of such gases that could be safely breathed by persons.

Tests were made of the amount and composition of exhaust gases of different types of cars and trucks under different conditions of service with special attention to the quantity of carbon monoxide generated. The city of Pittsburgh is contributing to the work by furnishing the machines needed. The results of the tests, when completed, will be used by the engineers of the tunnel commissions in planning the ventilation of the tunnel. They will also be of great value to users of cars and to dealers, as showing the efficiency of a motor car under specified conditions. These tests are being conducted under the direction of A. C. Fieldner, the supervising chemist at Pittsburgh.

In addition to knowing the quantity of gas likely to be generated in the tunnel, the ventilation engineers must also know the least quantity safe to breathe by men, women, and children passing through. Dr. Yandell Henderson, of the Bureau of Mines, is conducting tests in the medical laboratory of Yale University at New

Haven, Conn., on the toxicity of exhaust gases and the minimum percentage of carbon monoxide that a man can breathe several hours without ill effects. Tests are also being made on dogs and men in the laboratory and in a chamber in which an automobile engine is running.

The results of these investigations will undoubtedly be of great service in determining the design of the vehicular tunnels and the character of the ventilation. Further investigations, however, should be made with regard to engineering aspects of such tunnel work, and to the effects of varying conditions.

USE OF GEOPHONE IN MINING WORK.

A number of experiments were made at the experimental mine on the use and limitations of the geophone. Mechanical improvements effected tend to increase its value for locating a point underground by sound. This instrument, no doubt, will be of great aid in the future for locating entombed miners after a disaster, locating subterranean fires, etc. It may also be used in certain mine surveying. Alan Leighton, who is in charge of the work, has made a number of tests at the experimental mine, and has extended his observation by experiments in other mines. The geophone has been successfully used by the Bureau of Mines in locating mine fires and leaks in water mains.

WORK OF THE DISTRICT ENGINEERS.

The field investigations of the mining division are conducted by the field engineers of the bureau through the district engineers. For this purpose the United States is divided into nine districts with a district engineer in charge of each.

District A, termed the Northern Appalachian district, includes the States of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Ohio, West Virginia, Virginia, and eastern Kentucky. The headquarters are at Pittsburgh. The work of this district has been under the direct charge of J. W. Paul. The investigations of coal-stripping operations in Ohio and western Pennsylvania, of coal-dust explosion hazards in industrial plants, and the use of the geophone in mining, have already been mentioned. All accidents and mine fires occurring in this district during the year have been investigated.

District B, termed the Southern Appalachian district, includes the States of North and South Carolina, Georgia, Florida, Tennessee, Alabama, Mississippi, and Louisiana. W. B. Plank is the district mining engineer, with headquarters at Birmingham, Ala. Mr. Plank investigated a coal-mine fire in Alabama, and a shaft explosion in

a salt mine in Louisiana. At the invitation of the operators, he visited a number of coal mines and made recommendations regarding safety measures, especially advocating the introduction of miners' electric cap lamps in gaseous mines of Alabama. He conducted a number of tests for miners and mine officials in the safety-lamp gallery of the Birmingham station to show the effects of gas on safety lamps and also the effect of the different grades of fuel oil in safety lamps. He investigated the explosion hazard of a coal mine in Alabama and procured a 5-ton sample of coal from the mine, which was tested at the experimental mine at Bruceton, Pa. During the year he continued the preparation of a bulletin on coal-mining methods in Alabama.

Mr. Plank prepared monthly reports on the coal and mineral industries of the district; he investigated and reported on the use of underground loading devices in the zinc mines of Tennessee, the iron mines of Alabama, and the salt mines of Louisiana; he collected data on shot-firing methods. In collaboration with the explosives engineer, he investigated the use of explosives in the mines of Alabama; he assisted the supervising chemist of the Pittsburgh station in investigating and reporting on a by-product coke plant in Alabama.

District C, termed the eastern interior district, includes the States of Indiana, Illinois, Iowa, southern Michigan, western Kentucky, and northern and eastern Missouri. C. A. Herbert is district mining engineer, with headquarters at Vincennes, Ind. Mr. Herbert investigated explosions and mine accidents at coal mines in Illinois and Indiana and recommended safety measures to the mine operators, collected samples of mine dusts for tests at the experimental mine from coal mines in southern Illinois, compiled information on coal-mine atmospheres in Illinois and Indiana, and aided in the recovery work at the American No. 1 mine at Bicknell, Ind. Mr. Herbert also supervised the work of the mining-experiment station at Urbana and the studies of surface subsidence at coal mines in certain Illinois districts.

District D, termed the Lake Superior district, includes Minnesota, Wisconsin, and northern Michigan. C. E. Julihn is district mining engineer, with headquarters at Minneapolis, Minn. Mr. Julihn arranged for and presided at a conference of Lake Superior metal-mine safety men, held in Duluth June 23 to 25, inclusive, at which representatives from every mining range in upper Michigan, Wisconsin, and Minnesota were present. A similar conference was held a year ago, from June 19 to 20, 1919, also at Duluth. B. O. Pickard was then district engineer. Following the conference of 1919, Mr. Pickard assisted the officials of the iron-mining companies in planning a proposed cooperative rescue station on the Gogebic range.

He also made a study of reclaimed peat bogs in Minnesota at the request of the chief forester, with the purpose of determining more effective methods of combating fires. He collected data on mechanical loading devices in iron mines and cooperated with Dr. Kendall in investigating sanitary conditions at mines in the district.

In April, 1920, Mr. Pickard was transferred to district I, with headquarters at Berkeley, Calif. His successor, C. E. Julihn, is now serving in the double capacity of district engineer for district D, and as superintendent of the mining experiment station at Minneapolis. As stated previously, Mr. Julihn is making a study of Lake Superior iron-mining methods. Prof. Sperr, of the Michigan College of Mines, with the assistance of Mr. Ageton, is making a study of ground movements in the deep copper mines of the Lake Superior district.

District E, termed the Southwestern district, includes the States of Oklahoma, Arkansas, Texas, with the exception of the El Paso district, Kansas, Nebraska, southwestern Missouri, and J. J. Rutledge, the district mining engineer, with headquarters at McAlester, Okla., was the Government's engineering representative in preparing rules to govern the sale of coal and asphalt deposits in segregated Indian lands in Oklahoma, and assisted at sales held in November, 1919, and June, 1920. He compiled statistics on the coal production of these segregated coal lands from the inception of mining to 1918, and cooperated with the Union Indian Agency, Muskogee, Okla., in work on Indian mineral lands. He also prepared a report on the coal-mining possibilities of land on the United States military reservation, Fort Leavenworth, Kans., advised with operators on methods of mining pitching coal seams, and made studies of methods of applying asphalt cement to prevent slacking of mine roofs.

Dr. Rutledge, with the assistance of E. J. Gleim, assistant electrical engineer in the bureau's service, investigated the cause of and means of preventing electrical accidents in the mines in the thin coal in the Henryetta field. The coal seams average 3 feet in thickness, are quite level, and are mined by electrical mining machines. Three fatalities from electricity occurred during January and February, 1920.

Supervising mining engineer.—Daniel Harrington was appointed supervising mining engineer on technical investigations for the four western districts on February 1, 1920. He was especially instructed to keep in close contact with the district engineers in districts F, G, H, and I, for the purpose of correlating their work and promoting activity among the bureau's mining engineers in the West.

As the proper ventilation of metal mines and the protection of miners against dust were considered of great importance, all of the engineers and surgeons on the rescue cars in these four districts, when

not engaged in mine rescue or recovery work, were assigned to work under the direction of Mr. Harrington on these problems, which have been divided as follows:

1. Metal-mine ventilation.
2. Rock dust in relation to miners' pulmonary diseases.
3. High temperatures and humidity as affecting health of miners.

From March 23 to 27, a conference of all the western engineers and surgeons was held at Salt Lake City, and the three groups of problems were the main subjects of discussion. Ventilation and dust investigations have been carried on in Arizona, Idaho, Utah, and Montana according to the program outlined, and tentative arrangements have been made to extend the work into California, Colorado, and the Lake Superior region. Reports have been submitted of the investigations carried on in each mine, and composite reports as to mining districts are being prepared.

District F, termed the Rocky Mountain district, includes the States of Colorado, New Mexico, eastern Arizona, and the El Paso district of Texas. Daniel Harrington is the district engineer with headquarters at Golden, Colo. Dust and ventilation investigations were conducted by Mr. Harrington, together with Mr. McElroy and Dr. Koronski, of the United States Public Health Service, in the mines around Globe and Miami, Ariz. Similar investigations were made in mines around Oatman, Ariz., by Messrs. Harrington and Gardner, of the Bureau of Mines, and Dr. Saunders, of the United States Public Health Service. Mr. Harrington was assigned a problem on tests of explosives in metal mines, and was assisted by field engineers. Data have been collected for mines in Arizona, Colorado, Montana, Idaho, and Washington. The tests of explosives in metal mines in Arizona were conducted by Messrs. Forbes and McElroy, under the direction of Mr. Harrington.

During the fiscal year, J. J. Forbes prepared reports on 29 mines in Colorado and New Mexico, took 65 face samples of coal, 27 road-dust samples, 13 rib-dust samples, and 115 samples of mine air. Mr. Forbes investigated an explosion hazard at a mine of the Gallup Coal Co.

District G, termed the Intermountain district, includes Utah, eastern Nevada, southern Idaho, and southern Wyoming. Carl A. Allen is district mining engineer, with headquarters at Salt Lake City, Utah. Under a cooperative agreement with the State of Utah, Mr. Allen is also serving as State mine inspector for Utah. The Bureau of Mines, under this agreement, had the advantage of seeing its recommendations put into operation. Utah has one of the best sets of metal-mining and coal-mining regulations in this country, and the State officials are seeing that the regulations are properly enforced.

The operators and miners recognize the wisdom of these regulations and cheerfully comply with their requirements. During the year the coal-mining regulations were prepared under the direction of Mr. Allen, approved by the Bureau of Mines and the Industrial Commission of Utah, and made a State law.

An investigation was made of the occurrence of carbon dioxide in the mines of the Tintic district by R. V. Ageton and Dr. A. L. Murray.

District R, termed the Northern Pacific district, embraces the States of Washington, Oregon, Montana, North Dakota, South Dakota, northern Wyoming, and northern Idaho. George Watkins Evans was district mining engineer, with headquarters at Seattle, Wash., until August 1, 1919, when he resigned. Since the resignation of Mr. Evans the district has been under the direct charge of Daniel Harrington, the supervising mining engineer. Mr. Evans completed a paper on coal mining and coal-mining methods in the State of Washington. Mr. Harrington has made examinations of the mines in Butte, Mont., to observe recent improvements in their ventilation systems and methods of fighting mine fires and filling fire areas with slimes. Reports have been submitted for publication on ventilation, health of miners, and mine fires. Reports were also submitted relative to heroism of Butte miners in saving of lives of fellow miners, and as a result hero medals were awarded four Butte men by the Joseph A. Holmes Safety Association.

Dust-ventilation investigations were made by Messrs. Harrington and Dyer in the mines of the Coeur d'Alene region in Idaho, and reports are being prepared. Mr. Dyer made investigations of the Homestake mine fire in Lead, S. Dak., the Hercules mine fire, Burke, Idaho, and the Morning mine fire at Mullen, Idaho.

Mr. Harrington investigated the operations of the Gebo mine at Gebo, Wyo., under a Government lease, and various matters relating to phosphate properties in Montana and Idaho.

District I, termed the Southern Pacific district, includes California, western Nevada, and western Arizona. F. H. Hyder, who was district engineer at the beginning of the fiscal year, gave much of his time to cooperative work with the War Minerals Relief Commission. Mr. Hyder resigned in January, and on March 1 B. O. Pickard, who had been serving as the district engineer of district D, was transferred to district I, with headquarters at Berkeley, Calif. Mr. Pickard made an inspection trip through California and western Arizona, visiting many of the mines to inform himself thoroughly regarding the district. During this trip arrangements were made for extending the dust and ventilation work to California.

WORK OF THE FUELS DIVISION.

WORK OF THE CHIEF MECHANICAL ENGINEER.

O. P. Hood, chief mechanical engineer, with headquarters at Washington, was in charge of the fuels division. He conducted the following work directly from the Washington office:

SMOKE INVESTIGATIONS AT SALT LAKE CITY.

The cooperative investigation with the State of Utah and with Salt Lake City, with a view to the abatement of smoke in that city, was continued. The work has included studies of soot fall, Ringelmann chart readings, collection of data on heating and boiler plants, sampling and analysis of fuels used in the city, and sampling and analysis of the atmosphere. The study extended over the entire year, and a report has been prepared.

The investigation was under the general supervision of O. P. Hood, chief mechanical engineer, and under the immediate charge of Osborne Monnett, aided by H. W. Clark, Thomas Varley, G. St. John Perrott, and 14 assistants.

POWDERED COAL.

During the year work on the investigation of equipment and methods for burning powdered coal was conducted from both the Pittsburgh and the Seattle stations. B. J. Cross, junior chemist at the Seattle station, visited a number of large western plants burning pulverized coal, as well as various small house-heating plants, and studied storage, distribution, and handling methods, stoking and furnace equipment, and firing methods. He collected data on methods and equipment, and on causes and prevention of spontaneous ignition of stored coal. He subsequently visited a number of large plants in the East, and later was transferred to the Pittsburgh station, where the firing of coal dust is under study.

Cooperative work was continued with the Erie City Iron Works, Erie, Pa., on designing boiler furnaces to eliminate difficulties in burning powdered coal: a series of tests was made with powdered fuel.

REMOVAL OF ASH FROM POWDERED COAL.

Preliminary experiments were conducted at the Pittsburgh station on the removal of ash from powdered coal by the oil amalgamation process and at the Urbana station by the method of oil flotation. The purpose of these tests is to reduce the ash content of pulverized low-grade coal so as to make such coal more suitable for burning directly or in the form of briquets.

Results showed that the ash content could be reduced by using amalgamating or floating agents, but the proper method of distilling off the oils in the amalgam or the way to reduce the moisture in the flotation froth have not yet been developed.

The amalgamation process was also used successfully to remove mineral matter from natural flake graphite by treatment with oil and water.

The work is under the supervision of Mr. Hood; the work at the Pittsburgh station was performed by J. D. Davis with two assistants and that at the Urbana station by Messrs. Yancey and Frazier.

CHEMICAL INVESTIGATIONS OF FUELS.

Chemical laboratory research on fuels is conducted at the fuel laboratories of the Pittsburgh station, under the immediate direction of A. C. Fieldner, chemist.

COOPERATIVE WORK WITH THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS.

Research at the Pittsburgh laboratories on the efficient use of fuels, in cooperation with the American Society of Heating and Ventilating Engineers, began in August, 1919, and continued throughout the year. Preliminary work was done in the preparation of a standard code for testing house-heating boilers and in testing heat insulation. This work was conducted by Dean J. R. Allen, director of the bureau of research, American Society of Heating and Ventilating Engineers.

LIGNITE INVESTIGATION.

The investigation of lignite under the act appropriating \$100,000 for the purpose (Public, No. 259) was continued. In cooperation with the Ocatillo Products Co. a small carbonizing oven was erected at Salome, Ariz., for experiments with Texas lignite and for demonstrating the action of the carbonizing oven proposed by the bureau. After a careful survey of the facilities offered by cities in Texas, North Dakota, and other western States for a Government plant for large-scale carbonizing and briquetting tests of lignite, the town of New Salem, N. Dak., was selected. Plans are being prepared for the plant and an outline of proposed tests is being developed. S. M. Darling, fuel engineer, assisted the chief mechanical engineer in this work.

COKING TESTS OF ILLINOIS COAL IN KOPPERS BY-PRODUCT OVEN.

The Bureau of Mines, in cooperation with the Bureau of Standards, completed tests begun the previous year on the coking of coal from Illinois in a Koppers by-product oven at St. Paul, Minn.

INSPECTION AND ANALYSIS OF GOVERNMENT FUELS.

The work of inspecting fuel purchased for the Government was under the direction of N. H. Snyder, assistant engineer, aided by H. A. Goodman and R. J. Swingle, inspectors. Coal for the Panama Canal and the Panama Railroad Co. was inspected. Assistance was rendered the United States Fuel Administration and State fuel administrations. The offices of this section and the fuel-inspection laboratory were in Washington.

The fuel-analysis laboratory was under the supervision of H. M. Cooper, assistant chemist. Its work consisted of analyzing coals belonging to or for the use of the United States Government, and analyzing coal samples for the Federal and State fuel administrations. At the end of the fiscal year the laboratory was being removed to the Pittsburgh station, where it will be consolidated with the fuel laboratories of that station. In addition to the other advantages gained by this consolidation, the Pittsburgh station has better facilities for the operation and upkeep of laboratories, and is nearer the coal fields.

The bureau has continued to serve the Swiss Government in the matter of inspecting and analyzing coal exported to Switzerland, and has extended the same service to The Netherlands. The bureau lent one of its engineers to the Swiss Government to report on the inspection and analysis of coal as received in Europe, for the methods at Amsterdam had proved unreliable and those in Switzerland satisfactory.

INVESTIGATIVE WORK ON FUELS.

COOPERATIVE WORK WITH EMERGENCY FLEET CORPORATION.

The cooperative work on testing boilers for the Emergency Fleet Corporation continued during the year. A series of tests of oil fuel were made with various types of burners, including those of the Bureau of Steam Engineering. This work was conducted under the direction of Henry Kreisinger, engineer.

TESTS ON USE OF COKE IN HOUSE-HEATING EQUIPMENT.

In cooperation with a number of manufacturing companies and coke plants, comparative tests on the burning of coke and other fuels in domestic heating apparatus was conducted through the year. At the Minneapolis station a building for making heating tests was constructed and equipment was installed. Tests were made using coke, anthracite, and bituminous coal in steam house-heating boilers. The tests at Minneapolis were conducted by J. J. McKitterick, and those at Pittsburgh were under the immediate supervision of Mr. Kreisinger.

COOPERATION WITH THE SINCLAIR OIL REFINING CO.

The cooperative work with the Sinclair Oil Refining Co. continued during the year. Tests were run with coal-fired furnaces to determine what design of furnace should be used with different types of stokers to utilize the heat most effectively, and tests of oil-fired and gas-fired stills were conducted to determine relative efficiency. Recommendations were submitted regarding the design of furnace, the details of baffling, and the methods of firing which would give the most efficient use of fuel. This work was conducted by Mr. Kreisinger and three assistants at the company's refineries at McCook, Ill., and at East Chicago, Ind.

TESTS OF HEATING AND COOKING EQUIPMENT FOR UNITED STATES ARMY.

Under a cooperative agreement with the Army various types of coal, gas, oil, and electric stoves, ranges and bakers for field kitchens, and solidified-alcohol stoves were tested to determine the actual heating or cooking efficiency of stoves using different kinds of fuel and the most economical type for use under various conditions.

This work was conducted at the Pittsburgh experiment station by Mr. Kreisinger, representing the Bureau of Mines, and J. M. Goldman, representing the Army, assisted by a corps of 10 engineers, physicists, mechanics, and firemen.

SAFE MECHANICAL EQUIPMENT OF MINES.

During the year studies of mechanical equipment in mines were continued. The particular subjects investigated were safety catches for mine hoisting cages, safety gates for mine shafts, the safe construction of ladders and stairways, and a study of the mining laws pertaining to mechanical equipment. This work was conducted, under the supervision of Mr. Hood, by R. H. Kudlich, mechanical engineer, assisted by H. M. Motherwell, mechanical mine-safety engineer.

SAFETY CATCHES FOR MINE CAGES.

A study to determine the most satisfactory types now in use of safety catches for mine cages, of the requirements as to loads, speed of hoisting, and guides is being made. No laboratory work has been done, on account of lack of funds to procure the necessary equipment.

SAFETY GATES FOR MINE SHAFTS.

An investigation has been made to meet the demands of several State mining laws requiring safety gates for mine shafts. Types of gates and operating mechanisms in use at coal mines were studied,

and conclusions were drawn as to their reliability under actual working conditions. The results are being published in a technical paper.

LADDERS AND STAIRWAYS.

A study was made in order to present to the mining public in a compact form the present practice in and the safe construction of mine ladders and stairways. Data were gathered from reports of field investigations, technical journals, and publications of safety organizations. The results are being prepared for publication in a technical paper.

STATE COAL-MINING LAWS GOVERNING THE USE OF MECHANICAL EQUIPMENT.

A review of the various State mining laws relating to the use of mechanical equipment is being compiled.

OTHER ACTIVITIES.

Several mine accidents caused by mechanical equipment were investigated and recommendations were made as to means of preventing reoccurrence.

The mechanical division assisted the mining division in drawing up new mining laws for the State of Utah.

Mr. Ilsley, electrical engineer, and Mr. Kudlich, mechanical engineer, represented Mr. Hood as a member of the standardization committee of the American Mining Congress appointed to recommend a safety code for the use of electricity in mines. Technical Paper 138, "Suggested safety rules for installing and using electrical equipment in bituminous-coal mines," was taken as a basis for consideration, and after a thorough discussion was adopted with a few revisions necessitated by recent changes in practice.

The mechanical division cooperated extensively with the chemical section at Pittsburgh in conducting tests for the investigation of exhaust gases from motor-driven vehicles in cooperation with the New York and the New Jersey State tunnel commissions. (See p. 104.)

ELECTRICITY IN MINES.

The electrical section at the Pittsburgh station was engaged during the year on work connected with the present permissible schedules, on research work connected with new schedules, on field investigation of mine accidents due to electrical equipment, on the use of electrical equipment in mines, and made a study of State mine laws relating to electricity.

The work was conducted under the supervision of Mr. Hood by L. C. Ilsley, electrical engineer, assisted by E. J. Gleim, assistant electrical engineer, and A. B. Hooker, H. B. Brennot, H. B. Freeman, and R. A. Kearns, junior electrical engineers.

PERMISSIBLE SCHEDULES.

Manufacturers of explosion-proof motors, electric cap-lamps for miners, flame safety lamps, and methane indicators submitted equipment for test, under existing schedules. Two approvals for coal-cutting equipment and an approval for an electric cap-lamp were granted.

A schedule was established for single-shot blasting units, and one equipment was granted an approval.

Preliminary investigations leading to the establishment of permissible schedules for storage-battery locomotives and for multiple-shot blasting machines were conducted during the year, and schedules were established and published; no complete machines have yet been submitted for test under either schedule.

Work is being done constantly by the electrical section to control the equipment being manufactured under Bureau of Mines approvals.

Sometimes changes have been made by the manufacturer to improve his product rather than to reduce its cost of manufacture. For instance, a manufacturer of flame safety-lamps, who wished to eliminate rusting, substituted brass for iron-wire gauze. Tests showed that these gauzes were entirely unsuited for the purpose, and the manufacturer was required to furnish iron-wire gauze bonnets for all the lamps with brass-wire gauze bonnets he had put on the market.

FIELD INVESTIGATIONS.

During the year 30 field investigations were made. The reports prepared dealt with mine accidents and with the practical operation of electrical equipment, both approved and not approved, for the purpose of determining the proper requirements for safety and practicability under operating conditions.

MINING LAWS.

All the existing State mining laws governing the use of electricity in mines were studied and a comparison made of the requirements of the different States. The results are being published as a technical paper, and form the basis of a code of laws governing the use of electricity in coal mines.

Technical Paper 138, "Suggested safety rules for installing and using electrical equipment in bituminous-coal mines," was adopted, with a few alterations necessary to provide for the progress made since these rules were published (1916), as a standard code by the power and transmission subcommittees of the mining equipment standardization committee of the American Mining Congress.

The bureau's schedule for permissible storage-battery locomotives was informally adopted by the Pennsylvania department of mines as the specification for storage-battery locomotives used in coal mines in that State.

PUBLICATIONS.

Bulletin 78, "Approved coal-cutting equipment," by L. C. Ilsley and E. J. Gleim, describes fully the electrical coal-cutting machines for which approval was granted.

The following technical papers are in course of publication:

"The relative safety of brass, copper, and steel gauzes for use in flame safety lamps," by L. C. Ilsley and A. B. Hooker.

"Preliminary investigation of storage-battery locomotives," by L. C. Ilsley and H. B. Bennet.

"State laws governing the use of electricity in and about coal mines," by L. C. Ilsley.

USE OF CENTRAL BITUMINOUS COAL IN WATER-GAS SETS.

Experimental research was conducted through the station at Urbana, Ill., on the use of central bituminous coals as fuel in water-gas generator sets. The possibility of using Illinois and Indiana coals to replace eastern coke was demonstrated during the war and the practice is continuing, as cheaper gas can be made in this way. The present construction of water-gas sets is not well adapted to the use of high-volatile coals, and there is an opportunity to reduce further the cost of water gas by a more suitable construction. Much progress was made in the development of plans for types of water-gas sets specially adapted to this use. This work is in charge of W. W. Odell, gas engineer.

WORK OF THE DIVISION OF MINERAL TECHNOLOGY.

Dr. R. B. Moore, formerly in charge of the Golden station, was placed in charge of the division of mineral technology, November 1, 1919, succeeding Dr. C. L. Parsons, as chief chemist and chief mineral technologist. Dr. L. I. Shaw, assistant chief chemist, assisted in the work at the Washington office.

Throughout the year Dr. Moore has devoted much of his time to superintending the field and research program of the helium work of the bureau, described in another part of this report (p. 30).

The investigations conducted during the year are outlined below. Most of the investigative work was performed at the experiment stations, and is described more fully under the station reports on pages 71 to 120.

SPECIAL ALLOY STEELS.

The work on the preparation of special alloy armor-plate steels for test by the Navy was carried on during the year at the Ithaca office under Dr. H. W. Gillett, chief alloy chemist, and a report was written covering the investigation as far as completed.

ELECTRIC BRASS FURNACES.

The Ithaca office has continued to keep in touch with progress in electric brass furnaces, and a bulletin is being prepared on recent developments in the industry.

RADIUM AND URANIUM.

Experimental work on radium during the year at Golden, Colo., included a new series of experiments on the chemical effects of radium emanation in gas reactions, and cooperative study with Denver University in redetermining the spectra lines of radium emanation, and with the Colorado School of Mines on the redetermination of the radium-uranium ratio in carnotite ores. Assistance was rendered the Minerals Recovery Co., purchasers of the former plant of the National Radium Institute at Denver, Colo. After Dr. Moore went to Washington the work on radium was under the direction of Dr. S. C. Lind.

LUMINOUS PAINTS.

The study of the preparation of radium luminous paints, by C. W. Davis, at Golden, was continued. A method has been developed for preparing zinc sulphide, which is used in making phosphorescent paint.

PLATINUM.

Material was compiled by C. W. Davis, of the Golden station, for a report on methods of detecting and assaying platinum in ores.

ZIRCONIUM.

Results of a comprehensive study of zirconium, its preparation, chemistry, and uses, are being published in a bulletin written on the subject. This work was done by J. W. Marden and M. N. Rich.

ALUMINUM ALLOYS.

At the Pittsburgh station a study of methods for introducing copper into aluminum and the founding of light aluminum-copper alloys was made by R. J. Anderson, metallurgist, assisted by J. H. Capps, junior chemist.

In the casting of aluminum alloys the scrap losses are much higher than seems to be necessary in most plants. Mr. Anderson has studied the causes of scrap losses in aluminum casting and of means for preventing or minimizing such losses. A report was published by the bureau on this investigation.

A report on an investigation of hard spots in aluminum-alloy sand castings was also prepared.

BORON AND CERIUM STEELS.

Dr. H. W. Gillett, assisted by the men at the Ithaca station, began experiments on a new series of boron steels in order to determine the properties that boron imparts to steels. Preliminary tests of the effects of cerium on sulphur in steel were begun.

DIRECT PREPARATION OF PHOSPHOR COPPER BY ELECTRIC SMELTING.

Preliminary experiments by the bureau on the preparation of phosphor copper by direct smelting in electric furnaces indicate that the scheme is metallurgically feasible. This work was done under the direction of Dr. Gillett.

ANALYSIS OF RARE METALS.

A bulletin on methods of analyzing rare metals was prepared with chapters on vanadium, molybdenum, uranium, and other metals. This work was done by the men of the Golden station, under the direction of Dr. Moore.

TUNGSTEN ORES.

In cooperation with the Colorado School of Mines, a report was prepared on "Treatment of tungsten ores of Boulder County, Colo." This work was done by J. P. Bonardi and J. C. Williams.

FLOTATION OF MOLYBDENITE-CHALCOPYRITE ORES.

A report was prepared on the flotation method as applied to the separation of molybdenite from chalcoppyrite in the treatment of molybdenum ore. This work was done by W. H. Coghill, J. P. Bonardi, and C. O. Anderson.

METALLURGY OF ZINC DESCLOIZITE.

Zinc descloizite, a mineral not now being used in the United States, was studied by J. E. Conley, of the Golden station, with a view to developing practical methods of treatment. Deposits of undetermined size have been discovered in Nevada.

GRAPHITE.

Mr. Stull, of the Columbus station, continued a study of the crucible-making properties of American graphites and bond clays throughout the year. The work comprised the preparation and testing of crucible mixtures and actual tests of the more promising crucibles in furnaces at commercial brass and steel foundries at Detroit and Pittsburgh.

Experimental work on the fusibility of graphite ash and its effects on the refractoriness of bond clay was concluded. The results show that the temperature of the fusion point decreases with increased percentage of ash, and that no eutectic appears. The work on graphite is described more fully in another part of this report.

CLAYS.

Experimental work on washing, molding, and burning tests of samples of white clays collected from various deposits was continued at the Columbus station. Tests are being made of samples of clays submitted by the United States Geological Survey, the Bureau of Standards, and the General Land Office.

The testing of samples of fire clays for the Ohio Geological Survey was continued.

POTASH.

At the Berkeley station a study of methods used in potash recovery at Searles Lake was completed and a report was prepared.

At the Salt Lake City station laboratory experiments on the recovery of potash from the low-grade alunite ores of southern Utah showed that concentration and recovery by calcination, leaching, and electrical precipitation was feasible. The Aluminum Potash Co. continued experimental work in the station laboratories, using the bureau's furnace, leaching plant, and electrical treaters.

MAGNESITE AND DOLOMITE.

W. C. Phalen, at the Washington office, made a study of the magnesite deposits of Canada and of the uses of magnesite and dolomite in the United States. A number of reports reviewed the

magnesite industry of the United States with special reference to the commercial future of the industry after the war.

At the Columbus station experimental work was continued on the preparation, burning, and testing of dolomite and magnesite mixtures to determine their value for use as furnace linings.

Cooperative work has been carried on at the Berkeley station with the Northwest Magnesite Co. in connection with the preparation and standardization of magnesium oxychloride cement.

MAGNESIUM.

A report on the magnesium industry in the United States and the outlook for future developments of the industry was prepared by W. C. Phalen, mineral technologist. Mr. Phalen also prepared a short article on the use of magnesia cement for the protection of mine timbers.

SLATE QUARRYING.

An investigation of slate quarrying was begun by O. Bowles, of the Washington office. This inquiry has in view more efficient methods of quarrying and the utilization of the large amount of material at present wasted.

ACCIDENTS IN QUARRIES.

An unusual blasting accident in a quarry, which resulted in loss of life, was investigated by O. Bowles, in cooperation with J. E. Crawshaw, of the mining division, and a report prepared showing the causes of the accident, and making recommendations for the prevention of such accidents. Mr. Bowles also prepared a report on an accident from falling rock in a limestone quarry in Utah.

ASBESTOS.

Methods of producing and treating asbestos were studied. A series of short reports on asbestos, granite, and mica was prepared by O. Bowles.

ABRASIVES.

A schedule of information on corundum and emery was prepared for the War Department.

W. C. Phalen, mineral technologist, prepared a report on the occurrence, preparation, and uses of diatomaceous earth, or kieselguhr. This material is used extensively as a cleanser, polisher, insulator, and for other purposes, and is found in large deposits in the United States.

TALC AND SOAPSTONE.

Material was collected for a bulletin on the talc and soapstone industries by R. B. Ladoo, mineral technologist.

A number of short reports presenting information on special phases of the work, such as mining and milling methods, properties and uses of talc, and the bagging of ground talc were published in mimeographed form.

QUICKSILVER ORES.

Work on problems relating to the treatment of quicksilver ores was continued at the Berkeley station. Various mines in the Terlingua district of Texas, in Nevada, and in California, were visited and their methods of treating the ore observed. A bulletin on the metallurgy of quicksilver is being prepared. This work is under the direction of L. H. Duschak, chemical engineer.

WORK OF THE METALLURGICAL DIVISION.

The metallurgical work on the major metals during the year was under the general supervision of D. A. Lyon, as chief metallurgist.

The work of the division is conducted principally by the metallurgists of the experiment stations at Minneapolis, Minn., Golden, Colo., Salt Lake City, Utah, Tucson, Ariz., Berkeley, Calif., Seattle, Wash., and Fairbanks, Alaska. The work of these metallurgists is summarized under the chapters dealing with the experiment stations.

IRON ORES.

The United States has extensive deposits of low-grade iron ores that can not be smelted profitably under present methods. If these low-grade ores could be utilized, the iron reserves of the country would be enormously increased, but in order to obtain the iron, enough of the gangue and impurities in the ore must be removed to raise the iron content to the percentage required for profitable smelting, or else methods of smelting ore of lower iron content must be devised.

The bureau's work on iron is centered at the Minneapolis station, and is being conducted in cooperation with the School of Mines, University of Minnesota, and with the State mining experiment station.

The State experiment station and the mining companies have done, and are doing, much work on the development of methods for concentrating and washing low-grade minable ores, and for eliminating objectionable impurities, such as phosphorus and sulphur, to bring the ore up to commercial grade. The Minneapolis station is cooperating with the State mining experiment station in beneficiation tests of samples of low-grade iron ores, collected from dumps and stock piles by mining engineers of the station in their study on

mining equipment and concentration methods employed on the iron ranges.

The Bureau of Mines, however, is paying attention rather to the second phase of the problem, namely, the devising of practical methods for reducing ore which is considered too low-grade for blast-furnace smelting in present practice.

During the year an experiment blast-furnace was erected at the Minneapolis station, and tests are under way on possible methods of smelting low-grade manganese ores. This work has the further object of obtaining a comprehensive record of furnace data, and will be extended to include a general study of the operation of iron blast furnaces.

PHOSPHORUS DETERMINATION IN IRON ORES.

An investigation of methods for determining phosphorus in iron ore was made at the Minneapolis station and a report prepared on the subject.

Experimental work to determine the feasibility of removal of phosphorus from iron ores by leaching showed that the method is not commercially practicable.

IRON AND STEEL.

The Minneapolis station, preparatory to a study of heat treatment of drill steels, is collecting samples, and making preliminary metallographic tests.

Work at the Berkeley station on an investigation of methods of producing sponge iron continued throughout the year.

TREATMENT OF LOW-GRADE AND COMPLEX ORES.

In cooperation with the University of Utah and the mining companies of Utah, the Salt Lake station conducted extensive experiments on the chloride-volatilization method of treating low-grade and complex ores of silver, lead, and zinc. For many of the ores tested satisfactory methods of treatment have been worked out by the bureau and are being applied by the mining companies in the construction of volatilization plants based on the bureau's recommendations. Thus there have been rendered available large tonnages of ore hitherto left in the mines or on the dumps.

Experimental work, conducted at the Golden and Seattle stations, on the flotation of molybdenum ores from mines in Colorado, Utah, and other western States, as well as Alaska, have enabled the bureau to assist the mine operators effectively in improving milling methods.

The Fairbanks, Alaska, station has conducted milling tests of low-grade ores of copper, gold, chromite, antimony, and other

metals and aided mine operators in solving their milling problems. One of the principal objects of these tests is to work out simple methods using equipment that can be readily constructed at the mine and does not necessitate the freighting in of expensive or heavy machinery.

The Tucson station has cooperated with a number of mining companies in experimental work on the leaching of low-grade porphyry copper ores. Results obtained in the experimental work at Tucson are being applied in large-scale tests by the companies.

Colorado has large deposits of low-grade or complex ores carrying lead, zinc, copper, silver, and gold, which are not being worked, but which constitute an effective reserve to the potential resources of the State. With the depleting of the richer ores, attention is being directed increasingly to those of lower grade. Under a co-operative agreement with the State government, the Bureau of Mines and the State are conducting jointly an investigation of these ores to determine their extent, and to work out methods of treatment. Samples collected in the course of the field work are sent to the Golden station, where metallurgical tests on the more promising ores received are under way.

WORK OF PETROLEUM DIVISION.

GENERAL STATEMENT.

The petroleum division, under the direction of J. O. Lewis, chief petroleum technologist, continued its campaign of education and helped to call the attention of the oil and gas industry and of the consuming public to the fact that the need for efficiency in the production and utilization of petroleum and natural gas is greater than ever before.

The work of the division is classified under four headings, as follows: Production technology, engineering technology, chemical technology, and oil-shale technology. Under these four heads the men of the petroleum division have been assigned to specific problems and investigations, and the results have been published as technical papers and bulletins of the Bureau of Mines. There have also been disseminated a large number of special reports in technical and trade journals. Other reports made are of particular benefit or interest to certain districts, but not of interest to the public at large.

In a number of investigations of general nature, also, engineers of the Bureau of Mines gave their assistance, as in the preparation of operating regulations for oil and gas leases under the new leasing act of February 25, 1920. These regulations were drawn up for the purpose of protecting Government lands against waste and damage in the development of oil and gas lands that are to be leased by the

Federal Government. In connection with drawing up these regulations the Bureau of Mines requested and received the hearty cooperation of representative operators in the industry. Recommendations to the Secretary were drafted which were satisfactory to the representatives of the operators and to the bureau.

The petroleum division also cooperated with the national committee on natural gas conservation, appointed by Secretary Lane, for the purpose of making an extensive study of the natural gas situation and to formulate recommendations for conserving and prolonging supplies of natural gas in the United States. Several members of the petroleum division assisted in this work. Resolutions on the conservation of natural gas in production, transmission, and utilization were adopted which were later unanimously indorsed at a conference, held in Washington on June 11, composed of representatives of governors of natural-gas-using States and representatives of State utilities commissions. Representatives from several States informed the committee that they would recommend to their State legislatures the adoption of the resolutions. A meeting of the State utilities commissions of West Virginia, Ohio, Pennsylvania, Maryland, New York, and Indiana, was held on July 2. At this meeting, which was arranged through the national committee and the bureau, one representative from each of the commissions was appointed on a subcommittee to make an intensive study of local problems and to present a program of conservation for the consideration of the State commissions.

In order to stimulate efforts for conserving natural gas in the home, a specialist of the petroleum division gives lectures and demonstrations on the economical use of natural gas and gas-using appliances before home economics associations, public schools, or other organizations interested. As this work has been carried on with favorable results it appears that the consuming public is desirous of cooperating in the work of conservation.

Work in connection with oil-shale has aroused widespread interest; the States of Colorado and Utah have placed funds at the disposal of the Bureau of Mines for the purpose of extending its investigations of oil-shale.

Valuable assistance has been rendered operators in the oil fields of Oklahoma and Texas through recommendations and advice based on extensive study of conditions in these fields by engineers of the bureau.

Cooperative work in the Wyoming oil fields has also continued with effective results. A group of three companies, the Mid-West Oil Co., the Ohio Oil Co., and the Continental Co. in this field, near the close of the fiscal year 1919, voluntarily placed a fund of \$30,000 at the disposal of the Bureau of Mines for paying the salaries and

expenses of technical men and expert drillers in making investigations, and in giving assistance and advice on drilling and production methods in this field, looking toward the preservation of the fields from waste and damage by the infiltration of underground waters in the oil sands. A second joint fund of \$30,000 for continuing the work has recently been given to the bureau by these companies.

The Presidential Committee on Standardization of Petroleum Specifications, on which the Bureau of Mines is represented, deemed it necessary, on account of economic conditions and particularly as a matter of conservation, to revise the specifications drawn up during the war. New gasoline and lubricating oil specifications were prepared, and much work done toward the revision of specifications of other products in the future. The revision of the gasoline specifications alone has made it possible for the refiner to cut deeper into his crude oils and thus has made available many millions of gallons of gasoline that otherwise would have been lost to the automobile industry. The work of this committee is followed with considerable interest by the oil industry and by State agencies contemplating legislation to govern the sale of petroleum and its products. Although drawn up solely for governmental purchase, the specifications have been adopted by a number of the States as a standard.

PRODUCTION TECHNOLOGY.

DRILLING AND DEVELOPMENT.

A bulletin on methods of studying underground conditions in oil fields was completed by A. W. Ambrose and submitted for publication. It points out methods for detecting the source of infiltrating waters and means for avoiding difficulties from infiltration, emphasizing particularly the application of engineering principles.

A study of conditions in the Walters oil and gas field of Oklahoma has been made by T. E. Swigart, assisted by E. L. Sproat and H. N. Spofford of the Oklahoma State cooperative fund. The purpose of this investigation was to aid in conserving the resources of the field, to illustrate by practical applications the value of underground engineering work in connection with oil-field development, and to recommend efficient methods for use in operations looking toward increasing the ultimate production of the field at a minimum expense. The report was prepared in mimeographed form and contained a number of blue-print sketches of underground conditions in this field. It was distributed locally among the operators concerned for guidance in production and development.

A similar investigation was made of the Comanche oil and gas field by Mr. Swigart, and a report was prepared which indicated to

operators in this field methods of using records of drilling in correlating the formations penetrated and in overcoming difficulties with infiltrating waters. This report was distributed in mimeographed form to operators. This work resulted in locating oil sands which had been overlooked, thus increasing the potential production of the field.

A study of the Hewitt field in Oklahoma is under way, by C. E. Beecher and F. X. Schwarzenbek, of the Oklahoma State cooperative fund, under the direction of T. E. Swigart and A. W. Ambrose. The purpose of this investigation will be to assist the operators and stimulate their efforts toward more efficient methods of production and drilling. The study has gone far enough to indicate that the potential production of this field may be increased materially because certain productive sands had not been recognized by the operators and consequently had been passed when the wells were first drilled.

Conditions in the oil fields of Texas have been studied by R. E. Collom, assisted by J. B. Kerr and W. A. Snyder, who applied engineering principles to promote efficient methods of drilling and production. This work has been of value in discovering unsystematic methods of casing wells, which have resulted in waste and damage from infiltration of waters; and it has shown the necessity for greater care in testing all sands as they are passed in drilling.

At the suggestion of the director of the Bureau of Mines, the Rocky Mountain Petroleum Association was formed with a fund of \$30,000. The funds of the association were turned over to the Bureau of Mines for applying conservation measures in the Wyoming and other Rocky Mountain fields. Under the charge of F. B. Tough, assisted by B. H. Scott, R. R. Templeton, E. P. Campbell, W. Drake, and H. B. Hill, an intensive study of oil-field conditions has been made; reports have been prepared on certain fields, and recommendations have been presented on the drilling and repair of wells. The engineers and expert drillers of the Bureau of Mines have not only investigated cases of waste, but they have taken over the repair of many wells and supervised the repair of many others. The savings effected by the repair work performed by the engineers of the Bureau of Mines in one well alone, the Buck Creek Well No. 4 in the Lance Creek field, repaid within a few weeks' time the whole cost of the work for one year. The results were so satisfactory that the Rocky Mountain Petroleum Association, composed of the Midwest Refining Co., the Ohio Oil Co., and the Continental Oil Co., has voluntarily renewed the fund for the second year.

Waste of natural gas in the Monroe, La., gas field has been so enormous that the operators deemed it advisable to have an investigation made with recommendations for overcoming the difficulties encountered in drilling wells. R. S. Collom was assigned to this

work, and made a report that was distributed among the operators interested who received it favorably.

Problems in oil recovery are being studied by A. W. Ambrose and C. E. Beecher, of the Oklahoma cooperative agreement. Only a small percentage, perhaps not more than 10 or 20 per cent, of the oil contained in the sands underground is ultimately recovered. The purpose of this investigation, therefore, is to study methods which influence recovery on a laboratory scale by simulating conditions underground and to ascertain from the deductions reached thereby whether it is possible to increase the ultimate production from waning oil fields.

A report on perforated casing and screen pipe in oil wells, by E. W. Wagy, was published as Technical Paper 247. This paper suggests methods of perforating casing after it has been inserted in the well, and also illustrates the construction of and explains methods of inserting special casing known as "screen pipe." By the proper choice of perforations in casing and the correct use of screen pipe a saving in costs of operation can be expected and the ultimate production of a well materially increased.

A bulletin on casing troubles and fishing methods, by Thomas Curtin, explains methods of overcoming difficulties in handling long strings of casing in drilling oil wells. Special fishing tools and methods are described.

Prospecting and testing oil, gas, and water-bearing strata, a bulletin by R. E. Collom, now in course of publication, will point out the great necessity for care in taking samples as wells are drilled, and how this information may be correlated to the best advantage. The importance of this investigation lies in the fact that frequently, in the rotary method of drilling wells, productive oil sands are unintentionally passed.

In connection with the new leasing act of February 25, 1920, the Bureau of Mines drew up operating regulations for the drilling and producing of oil and gas wells on Government-leased land looking toward the protection of lands from waste and damage from infiltrating waters and other sources. These regulations were drafted by J. O. Lewis, F. B. Tough, E. W. Wagy, and R. E. Collom. In this work the hearty cooperation of the operators in the fields was secured, and at a conference of representatives of the industry called on April 1, 1920, the regulations, with very little revision, were unanimously indorsed. These regulations are much like those that have been in force for several years on the Osage Indian lands of Oklahoma, and have proved effective in conserving oil and gas.

R. Van A. Mills continued his study of the action of water, oil, and gas in underground strata. By means of a number of well-illustrated laboratory experiments, he has been able to prepare a

valuable report upon the underground movements and rearrangements of these fluids incident to the drilling and operation of wells which will soon be published in one of the technical journals. With other work of this kind now being carried on by Mr. Mills, these experiments will form the basis of a bulletin. Mr. Mills's work will assist materially in arriving at a better understanding of fundamental underground conditions and will aid in overcoming water troubles and consequent injuries to pay sands.

A report on "Factors in oil-field production," by C. H. Beal and J. O. Lewis, which will be published as a technical paper of the Bureau of Mines, points out economic principles in drilling and producing wells. Spacing of wells is discussed, and the relation between spacing of wells and the price paid for petroleum is described in a way that will guide operators in future development.

A report on the Boulder oil field of Colorado was prepared by E. W. Waggy. Local interest, economic conditions in regard to the petroleum industry, and conditions of production and consumption made it desirable for this report to be published locally. The report contains a discussion of present conditions in the fields, points out the need of keeping reliable records of wells, and gives recommendations for drilling and for conserving the future production of oil and gas.

Experiments on the action of underground waters on oil and gas have been continued by R. Van A. Mills and E. C. Lane. Information gained by experiments indicate the possibility of shutting off undesirable underground waters by the use of chemicals.

The drilling of wells through coal seams has become an important question. In several of the States regulations looking toward the preservation of life and property in carrying on this work are contemplated, and, accordingly, the cooperation of the Bureau of Mines has been requested. Proposed regulations for drilling wells through coal seams were published by the bureau in 1913 as Technical Paper 53. Since that time drilling methods have materially changed and improved; hence E. W. Waggy is making a revision of these regulations.

The use of engineering methods in evaluating oil and gas properties holds such a great advantage over the old way of guessing at values that the Bureau of Internal Revenue of the Treasury Department, at the recommendation of the Bureau of Mines, has adopted such methods for evaluating oil and gas lands in taxation. Realizing that this work is just beginning, and that there is a great deal more to be obtained from the study of the records of oil-well production, the Bureau of Mines is investigating and developing new principles for evaluating oil lands. This work has been carried

on by W. W. Cutler, jr., in cooperation with the Bureau of Internal Revenue.

Difficulties had arisen between lessees and lessors of gas lands on the Osage Reservation regarding the value of the gas, and insufficient data were at hand on which to base a fair decision. As an investigation was requested, a study of the value of the natural gas in the Osage Nation was completed, and a report prepared for the Secretary of the Interior on the results of the work. This investigation was under the direction of H. R. Pierce and W. P. Dykema.

In consequence of litigation between the States of Texas and Oklahoma regarding oil lands along the Red River, the Government took over certain lands and is operating them pending the settlement of the controversy. Frederick H. Delano was appointed receiver by the Supreme Court to operate the wells that already had been drilled on the lands, and it was desirable to make an investigation at once in regard to the producing wells and recommendations for future drilling. The cooperation of the Bureau of Mines for technical assistance and advice was requested. R. E. Collom investigated the condition of the property and presented recommendations for improving conditions on the leases in the interest of conservation of equipment and oil produced.

The petroleum bibliography is now compiled in sections which are immediately issued in mimeographed form, to be assembled later as an annual bulletin. The bibliography for 1918 is now in course of publication. These annual bibliographies have greatly assisted public libraries, technical institutions, and the industry in general, by keeping them informed of the literature on petroleum and allied substances.

COOPERATION WITH COMMITTEE ON CONSERVATION OF NATURAL GAS.

In January, 1920, the acute problem of present and future supply in the natural-gas industry was drawn to the attention of the Secretary of the Interior by Mr. Samuel S. Wyer, of Columbus, Ohio. Believing that something should be done immediately to conserve resources of natural gas and thus prolong the supply in the United States, Secretary Lane called a conference of representatives of the industry. At this conference a resolution was adopted requesting Secretary Lane to appoint a committee, with the director of the Bureau of Mines as chairman, and with the chief of the petroleum division as secretary, to make an extensive study of the situation and to formulate such recommendations as were deemed appropriate for conserving the natural gas in the country. J. O. Lewis and E. W. Wagy assisted as secretaries, ex officio, for the committee in promulgating the resolutions adopted by the committee. These resolutions

were ultimately indorsed by the national conference held in Washington on June 11 by representatives of governors of States using natural gas and State utilities commissions.

As a result of the work of this committee the Bureau of Mines, as a disinterested party, has been able to obtain information and to present facts which were acceptable to all concerned; thus the cooperation of the industry was secured and attention was directed toward the need of prompt action in behalf of conserving natural gas.

Closely associated with the work of the national committee for the conservation of natural gas, the Bureau of Mines deemed it advisable to point out definitely to the public, by giving lectures and demonstrations on the efficient use of natural gas and gas-using appliances, how savings could be made; the cooperation of the people in a general conservation campaign was thus sought. S. S. Wyer, consulting engineer of the bureau, and Olga A. Elifritz, specialist in natural-gas conservation, have visited a number of gas-using cities and have given lectures and demonstrations. They also have represented the Bureau of Mines at public exhibits.

REFINERY STATISTICS.

The petroleum division has continued during the year the collection of statistics showing the refinery output of gasoline, kerosene, lubricants, fuel oil, and miscellaneous oils, and the amount of crude oil run to stills. These figures, which are sent monthly to all refining companies and to others interested, keep the public and the trade advised of seasonal demands and the condition of the industry as regards production, consumption, and stocks.

Compilation of a list of refineries in the United States with their respective capacities has proved of much importance in pointing out that refineries have been built in the United States with a total capacity of one and a half million barrels a day more than the daily production of crude oil. This condition is not a healthy one, and the information compiled has been valuable in disclosing the need of precaution in planning or building refineries in future.

ENGINEERING TECHNOLOGY.

The study of losses of oil by evaporation during storage and transportation was continued during the year by J. H. Wiggins and A. R. Elliott, under the direction of C. P. Bowie. Mr. Wiggins has confined his investigation to the Mid-Continent oil fields, and Mr. Elliott to those of California. These investigations have shown (1) that during the year 1919, 122,100,000 gallons of gasoline were lost by evaporation from crude oil in the Mid-Continent oil fields alone, and (2) that it is possible to eliminate at least half of these losses at little

expense. Especial attention has been given to the effect of paint of different colors and of construction devices for preventing evaporation from tanks. Results of the investigation in the Mid-Continent field will soon be ready for publication; the work in California is still under way.

Experiments have been conducted on the cracking of heavy oils with special processes and apparatus devised by C. P. Bowie and M. J. Gavin. Large quantities of heavy oils are difficult to transport through the pipe lines or to use as fuel because of their high viscosities and have not been profitable to crack in order to obtain gasoline and other light products. By the processes devised by Messrs. Bowie and Gavin these heavy oils and tars can be cracked to make lighter products containing considerable gasoline and low-viscosity fuel oil; difficulties from the forming of carbon and tars seemingly have been eliminated. Tests of the processes should now be made on a commercial scale. If commercially successful, the processes will make possible the production of gasoline from the heavy oils and residuums produced in California, Mexico, and elsewhere; they will also provide fuel oils with lower viscosities which are therefore more satisfactory for use on ships.

A paper on oil-camp sanitation, by C. P. Bowie, points out the value of maintaining proper sanitary conditions in oil-field camps. Proper sanitation increases efficiency among employees and thus effects a marked economic saving.

A bulletin on methods of manufacturing and testing carbon black, by R. O. Neal and G. St. J. Perrott, is now in course of publication. Mr. Neal confined his efforts to the manufacturing of carbon black in the field; the laboratory and testing work was carried on by G. St. J. Perrott, physical chemist at the Pittsburgh station. Assistance was also rendered by R. Thiessen in making microscopic examination of samples of black carbon. This paper is of especial value to anyone contemplating the construction and operation of a carbon-black plant.

An investigation, by R. O. Neal and W. P. Dykema, of residual gases from compression plants for making gasoline from natural gas brought out the fact that a definite saving can be made by treating the residual gas by absorption methods. For instance, in 30 tests at plants throughout the mid-continent fields it was ascertained that the gasoline content in the residual gas from these plants averaged 0.337 gallon per 1,000 cubic feet. By means of an auxiliary absorption equipment this saving has been obtained in several plants at a cost that will soon be offset by the increase in the volume of production of the entire plant. At one plant in Oklahoma an increase of 30 per cent in the recovery of gasoline was effected.

In connection with investigation of methods of storing helium gas underground, being conducted by the Bureau of Mines in cooperation

with the Army and Navy, J. O. Lewis, chief of the petroleum division, has given advice and assistance.

CHEMICAL TECHNOLOGY.

Petroleum problems of a chemical nature are in charge of Dr. E. W. Dean, petroleum chemist, whose headquarters are at the Pittsburgh experiment station. Some of the more important investigations are as follows:

SURVEY OF THE MOTOR GASOLINE MARKETING IN THE UNITED STATES.

In April, 1919, 851 samples of gasoline were collected from different parts of the United States, and by August 1 analytical work on these samples was completed. This work was conducted by Dr. Dean and H. H. Hill, with the assistance of the entire personnel of the Washington and Pittsburgh laboratories. Mr. Hill made an exhaustive study of the results, which are presented in a bulletin entitled "Quality of gasoline marketed in the United States" now in the process of publication.

In January, 1920, a less extensive survey of motor gasoline was carried out by N. A. C. Smith and C. R. Bopp at the Washington laboratory, samples being collected from seven representative cities and the analytical results compared with those in 1919. This comparison showed that the quality of motor gasoline was practically the same as in April, 1919. The report on this study was published in multigraphed form in the "Reports of investigations," of February, 1920. It is planned to make similar surveys in January and July of each year in order that the bureau may have first-hand information of changes in the quality of motor gasoline throughout the country.

STANDARDIZATION OF PETROLEUM SPECIFICATIONS.

The results of the Bureau of Mines survey form the basis of a report to the committee on standardization of petroleum specifications. Using this report as a basis the committee, with M. L. Requa, consulting engineer of the bureau, as chairman, and Dr. G. W. Gray, consulting engineer of the bureau, as technical adviser, voted, in November, 1919, to revise the specifications for motor gasoline for Federal purchases. H. H. Hill and J. O. Lewis represented the Bureau of Mines on the committee on standardization of petroleum specifications, and Mr. Hill and Mr. N. A. C. Smith on the technical subcommittee. In November the committee started work on the standardization of specifications for lubricants. Methods of testing lubricants and drafts of specifications were adopted in April, 1920. The Bureau of Mines cooperated in the work of the committee and also published the committee's reports, Bulletins 3 and 4.

OTHER INVESTIGATIONS.

A survey of the crude oils of the United States is in progress under the direction of Dr. Dean. Representative samples from the oil fields east of the Mississippi and from the California fields are being analyzed. It is planned to obtain samples from the Mid-Continent, Texas, and Wisconsin fields during the coming year. The results, with a large number of analyses made by the Bureau of Mines, will be published as a bulletin.

A bulletin in course of publication on methods of distillation includes a treatment of special methods developed by the Bureau of Mines for analytical distillation of crude petroleum and its products. This work has been carried on by E. W. Dean, H. H. Hill, N. A. C. Smith and W. A. Jacobs.

The building of an experimental oil refinery has been in charge of H. H. Hill, assisted by D. B. Dow and C. R. Bopp. The installation of stills and accessories was completed in May, 1920. A few experimental runs have been made which show that the plant will prove of great value in the experimental work on refinery methods, and in the work on recovering gasoline from still vapors which is being carried on by Mr. Dow.

The loss in heating value of natural gas through the removal of gasoline has been a point of controversy between gas companies and consumers. To decide the matter the Bureau of Mines made a careful study which proved that in the natural gas ordinarily sold the loss of heating value is negligible. This work was done by D. B. Dow.

Work to determine the substances in gasoline which cause gumming and corrosion in automobile engines, and to find methods for removing or neutralizing them is being done by N. A. C. Smith.

An improved apparatus for the determination of water in petroleum and other organic emulsions has been designed by E. W. Dean and D. D. Stark, and is described in the *Journal of Industrial and Engineering Chemistry*, vol. 12, page 486.

A technical paper covering experimental work on the manufacture of gasoline by cracking heavier hydrocarbons, prepared by E. W. Dean and W. A. Jacobs, is in process of publication.

Committee D-2 of the American Society for Testing Materials has recently been reorganized to cover the entire subject of testing petroleum and its products. Dr. Dean has been appointed on several of the subcommittees under this committee.

The Bureau of Mines has been called on to advise several States and municipalities in regard to drawing up specifications for and testing petroleum products, particularly gasoline and kerosene. This work has been handled largely in connection with the work of the Committee on Standardization of Petroleum Specifications.

Methods for the determination of asphalt in residuums from the distillation of crude oil have been studied. This work will be continued during the present year as an entirely satisfactory method has not yet been found.

During the year a large number of analyses and tests of petroleum and its products were made for the Bureau of Mines, the Geological Survey, the Shipping Board, Panama Canal, Post Office Department, and other governmental agencies. This work was handled by the Pittsburgh and Washington laboratories under the direction of Dr. Dean, and was done by A. D. Bower, David C. Dunn, R. E. Mason, W. B. Lerch, D. Stark, C. R. Bopp, and P. A. Draper.

A special study of fuel oil was made in connection with the samples submitted by the Shipping Board, and revised methods of analysis were worked out.

OIL-SHALE TECHNOLOGY.

The rapid strides made in recent years in the consumption of petroleum and its products, the difficulty of equalizing production and consumption, and the resultant economic conditions have stimulated interest in other possible sources of supply.

One of these is the vast deposits of oil shale in some of our western States. Under the direction of M. J. Gavin, oil-shale engineer, L. C. Karrick, and T. B. Brighton, investigations at Salt Lake City, Utah, have been made on a laboratory scale. Much has been accomplished in standardizing methods of testing so that results in future can be obtained by running comparable tests of oil-shale products. The bureau has been fortunate in having two cooperative funds of \$10,000 each placed at its disposal to extend this work, one from the State of Utah and one from the State of Colorado. At Boulder, Colo., an experimental oil-shale retort has been installed and tests have been begun of shales in that district. The work of this laboratory is carried on by L. L. Sharp under the direction of Mr. Gavin. A report by M. J. Gavin on the oil-shale investigations for the year, pointing out the results of a series of laboratory experiments on retorting oil shale, will soon be ready for publication.

Cooperative oil-shale work was carried on with the Southern Pacific Co. at Elko, Nev., where a retort of the Pumpherson type was erected by the Southern Pacific Co. under the technical direction of Dr. David T. Day, consulting engineer of the bureau. Several preliminary runs were made before it was necessary to shut down the plant on account of inclement weather.

M. J. Gavin has prepared a paper on oil shales and their economic importance. The various products to be obtained from oil shales and the method of obtaining them are described, as well as the relation of requisite investment and expected returns. A bulletin on oil shale is now in course of preparation.

WORK OF THE MINING EXPERIMENT STATIONS.

BARTLESVILLE STATION.

The petroleum station at Bartlesville, Okla., was under the direction of W. P. Dykema as superintendent until January 31, 1920, when he was succeeded by A. W. Ambrose.

UNDERGROUND CONDITIONS IN OIL FIELDS.

A bulletin by A. W. Ambrose on "Underground Conditions in Oil Fields" is in course of publication. Lack of printing funds prevented the publication of the bulletin during the fiscal year. To avoid delay in getting valuable information before the public, the more important chapters of the bulletin were published in oil journals.

DEVELOPMENT PROBLEMS IN THE COMANCHE DISTRICT.

T. E. Swigart, petroleum technologist, did considerable work in the Comanche oil and gas district, Stephens County, Okla., in aiding operators in developing the irregular and lenticular oil sands there. Results of the investigations were described in a report published in mimeographed form by the Bureau of Mines. This report describes the general underground structure of the district, and contains a structural contour map of the principal oil sand, cross sections showing the depths to the oil, water, and gas sands, and suggestions as to the best methods of drilling and casing wells.

DEVELOPMENT PROBLEMS IN THE WALTERS OIL AND GAS FIELD.

A similar investigation was made in the Walters oil and gas field, Cotton County, Okla., by Mr. Swigart, assisted by E. L. Sproat, geological engineer, and H. N. Spofford, geological engineer. About 400 well records and logs were examined and maps were prepared showing the structure of the oil sands, cross sections of the strata, and other essential data. A report on the results of the investigations was distributed to operators and other interested parties through the Bartlesville Chamber of Commerce.

The report indicates places where operators using rotary tools have cased off oil sands in some parts of the field, and other places where lower productive sands can probably be found by deepening wells.

HEWITT FIELD INVESTIGATION.

T. E. Swigart, assisted by F. X. Schwarzenbek, assistant petroleum technologist, and E. L. Sproat are making a similar investigation in the Hewitt oil field in southern Oklahoma. This is one of the most important new fields of the Mid-Continent region, the pipe line runs

for June averaging approximately 22,000 barrels daily. The Hewitt field offers unusual opportunities for studying underground conditions as the producing sand, owing to decided dips in the structure, lies at widely different depths in various sections of the field, and consequently a number of operators were under the erroneous impression that several oil sands were being encountered. A peg model that will show graphically the underground structure of this field is being constructed by E. L. Sproat.

METHODS OF INCREASING RECOVERY OF OIL FROM OIL SANDS.

A. W. Ambrose and C. E. Beecher, petroleum engineer, are working on problems relating to methods for increasing the recovery of oil from oil sands. In addition to reviewing the literature on the subject, laboratory experiments have been carried on by Mr. Beecher, and field work on production problems is under way. Methods of production employed in a certain district are being investigated with a view to determining why some wells produce more than offset wells. By regulating the rate at which the gas is allowed to force the oil from a sand, larger quantities of oil, it is believed, can be recovered.

EVAPORATION LOSSES OF OIL IN STORAGE AND TRANSPORTATION.

J. H. Wiggins, assistant engineer, completed the investigation of losses of oil in the Mid-Continent field during storage and transportation, and later went to California to assist in similar work being done there by C. P. Bowie and A. R. Elliott. The analytical work at Bartlesville was done by Marcellus Law, junior chemist.

Of the results of this investigation two of the most important findings were: (1) That 122,100,000 gallons of gasoline were lost on leases by evaporation from the crude oil during 1919; (2) that two-thirds to four-fifths of this could have been saved at low cost.

VALUE OF GAS IN THE OSAGE NATION.

H. R. Pierce, assistant natural-gas engineer, assisted by J. R. Stewart, assistant natural-gas engineer, completed the work on determining the value of natural gas in the Osage Nation and prepared a report, which was submitted to the Secretary of the Interior. The object was to provide information for adjusting differences between lessees and lessors of gas lands in the Osage reservation. The report presents valuable data on gas not only in the Osage Nation but in other parts of the country.

GASOLINE FROM NATURAL GAS.

At various gasoline plants in the Mid-Continent field tests were made with the special absorption tester designed by the Bureau of Mines in order to ascertain the efficiency of the plants. At many

plants a large part of the gasoline of the natural gas treated was not being extracted, and the operators had no definite knowledge of the actual extent of this loss. As a result of the bureau's activities it is estimated that thousands of gallons of gasoline have been added to the country's production. At one plant in Oklahoma an increase of 30 per cent in the gasoline recovery was effected. The results of this investigation have been published in a technical paper by W. P. Dykema and R. O. Neal.

EFFECT OF GASOLINE REMOVAL ON THE HEATING VALUE OF NATURAL GAS.

Experiments on the heating value of treated and untreated natural gas have shown that removal of the gasoline has little or no effect on the calorific value of the gas; the saving of any gasoline present, therefore, may be regarded as adding that much to the country's resources. The results of the experiments by D. B. Dow, assistant organic chemist, were published as a technical paper.

MANUFACTURE OF CARBON BLACK.

R. O. Neal prepared for publication a report on the methods used in the manufacture of carbon black, describing in detail the construction of buildings and apparatus, giving data on yields from different gases, and discussing the effect of quality on the uses to which the product can be applied. Mr. Neal developed a laboratory method for analyzing natural gas to determine the obtainable yield and quality of carbon black.

GASOLINE FROM REFINERY STILL VAPORS.

D. B. Dow is engaged in studying methods of recovering gasoline from still vapors at refineries. He has visited a number of refineries and has collected preliminary information on the problem, including data on costs and construction of various types of equipment and data on plant efficiency. A small portable tester has been constructed for determining the gasoline content in the vapors from different stills and the efficiency of apparatus installed for treating the vapors. Mr. Dow will make use of the experimental refinery at the Bartlesville station for conducting further tests.

CONSTRUCTION AND OPERATION OF A SMALL EXPERIMENTAL REFINERY.

H. H. Hill, refinery engineer, assisted by Mr. Dow, and C. R. Bopp, refinery operator, completed the construction of a miniature refinery at the Bartlesville station. The plant consists of a 5-barrel still, three 1-barrel stills, condensers, agitators, run-down tanks, and

storage tanks, and is a complete plant for producing gasoline, kerosene, gas oil, and fuel oil. Equipment for the removal of wax and for the production of lubricating oils is contemplated. This refinery is being used for studying problems encountered in the refining of different crudes and of devising possible improvements in methods, and for investigating the recovery of gasoline from still vapors and the use of fractionating towers.

LOSSES IN DISTILLING ABSORPTION GASOLINE.

Mr. Dow conducted a series of experiments to determine the losses in distilling various saturations of "mineral seal oil," one of the common agents for absorbing gasoline vapors from natural gas, by fire and by steam. The experiments were intended to show what proportion of the gasoline absorbed is retained by the oil and returned with it to the absorption apparatus, thus reducing the absorption capacity of the oil. The results of the investigation have been prepared for publication in various oil journals.

EFFECTS OF LATENT HEAT ON ABSORPTION OF GASOLINE VAPORS FROM NATURAL GAS.

W. P. Dykema, consulting engineer, and A. A. Chenowith, consulting engineer, prepared a report on the "Effect of latent heat on absorption of gasoline vapors from natural gas." This report covers construction and operating of an absorption plant for recovering gasoline from rich casing-head gas, and deals particularly with the effects of heat generated in the absorption towers.

STUDY OF FRACTIONATING TOWERS.

An investigation of the use of fractionating towers as a means of increasing the yield and quality of gasoline and other light oils has been started by H. H. Hill. A number of small refineries do not use fractionating towers, and it is believed that pointing out the advantages of towers will make their use more general. Mr. Hill has collected data on costs and construction features of towers now in use.

BERKELEY STATION.

L. H. Duschak, superintendent of the Berkely station, in addition to administrative duties, paid special attention to work on potash. He and other members of the station spent much time assisting the War Minerals Relief Commission in field investigations in California. He also spent part of the year in Washington as acting chief metallurgist. The work of the station for the year is outlined below.

METALLURGY OF QUICKSILVER.

Metallurgical practice at a number of quicksilver mines in the Terlingua district, Texas, and at mines in California and Nevada were studied. A quicksilver prospect in the Jersey Valley, south of Battle Mountain, Nev., which had attracted some attention, was examined.

In cooperation with the Oregon Bureau of Mines and Geology experiments were made to determine the probable furnace behavior of a quicksilver ore high in sulphur.

Because of lack of funds the quicksilver work was suspended early in the year and C. N. Schuette, who assisted Mr. Duschak in the investigation, left the bureau.

VOLATILITY OF METALLIC COMPOUNDS.

The study of the chemistry of volatilization of metallic compounds in conjunction with the investigation at the Salt Lake City station of the chloride-volatilization method for complex ores containing lead, zinc, and silver, was continued during the year.

Experiments to determine the vapor pressure of silver chloride were conducted by Messrs. Duschak and Bouton.

Mr. Bouton also studied the apparent reaction between metallic silver, or silver chloride, and silica at temperatures around 1,000° C. He found that some silver was so intimately associated with the silica that only subsequent fluxing or decomposition with hydrofluoric acid would release it.

Mr. Riddell, with Mr. MacKenzie, of the Salt Lake station, studied the chemical reactions involved in the chlorination of silver minerals.

A bibliography of the properties and reactions of silver compounds, particularly the chloride, was prepared by Messrs. Bouton, Eastman, and Duschak.

PRODUCTION OF SPONGE IRON.

A study of the fundamental physical and chemical factors involved in preparing sponge iron is being conducted by E. D. Eastman, physical chemist. Dr. Eastman made a thorough study of the literature bearing on the subject with particular reference to the reduction of iron oxides by fuel gases. He has made a series of calculations showing the theoretical reducing power of different fuel gases in the production of metallic iron and the lower oxides of iron. The calculations promise an interesting application of thermodynamics to a practical metallurgical problem.

MAGNESITE INVESTIGATION.

In December, 1919, the bureau entered into a cooperative agreement with the Northwest Magnesite Co. for a study of the technology of the manufacture of caustic magnesia intended for use in oxychloride cement. The investigation is in progress at the Berkeley station. Methods for the analysis of magnesite, with special reference to the determination of calcium, were investigated. A description of the method finally adopted is given by W. C. Riddell in the Mining and Scientific Press of June 26, 1920. A method for the determination of free lime in caustic magnesia has been developed.

In an electrically heated rotary furnace, 60 inches long and 4 inches inner diameter, samples of magnesite are being calcined under various conditions of time, temperature, and other factors. The calcined material is used in making oxychloride cement, which is tested for tensile strength, soundness, and other properties.

SULPHUROUS-ACID LEACHING OF COPPER ORES.

C. M. Bouton prepared a report on the chemical problems involved in the sulphurous-acid leaching in progress at Miami, which is being conducted in cooperation with the Tucson station. The report included a summary and analysis of the operating data collected, a discussion of the solubility of sulphur dioxide in water as applied to dilute sulphur dioxide gas, and suggestions for further work on the leaching problem.

POTASH PRODUCTION AT SEARLES LAKE.

The study of the production of potash at Searles Lake and the methods, costs, and efficiencies of the different plants there was completed during the year, and a brief summary covering the results of the work was prepared by Messrs. Duschak and Riddell.

ACTION OF OLEIC ACID IN FLOTATION.

A report was prepared for the Seattle station on the behavior of oleic acid in aqueous solutions, with particular reference to the flotation process.

MISCELLANEOUS.

Samples of gas from an old mine shaft which had been sealed for some time were examined in order to ascertain the possible danger from these gases in reopening the mine.

A comprehensive outline of the chemical and metallurgical problems of the mineral industry of California and adjacent States was completed.

COLUMBUS STATION.

The purposes of the Columbus experiment station of the Bureau of Mines are the investigation of ceramic raw materials, their mining, refining, and utilization in the manufacture of finished products, the investigation of ceramic manufacturing problems with the object of eliminating waste, of reducing the cost of production, and of improving the quality of products.

The ceramic industries include a very broad field of manufacturing and the comparatively large number of different products and industries are classified under five general groups, known as clay and allied products, cements, limes and plasters, glass, enamels for metals, and abrasives. Although a very large number of minerals are drawn upon to supply the five ceramic groups with raw materials, the materials used in greatest quantities are clay, sand, limestone, and gypsum.

PERSONNEL.

The personnel of the Columbus station consists of a superintendent, R. T. Stull; ceramic chemist, H. G. Schurecht; assistant ceramic engineer, R. N. Long; and three ceramic assistants, H. W. Douda, J. A. Martz, and R. T. Watkins. All of these men are graduates from university ceramic courses with the degree of bachelor of engineering in ceramics. The nontechnical work of the station is performed by a clerk, J. A. Rinehart, a stenographer, Myrtle B. Rinehart, and an unskilled laborer, D. H. Dawson, making a total personnel of nine.

Employees who resigned during the year were M. C. Booze, ceramic engineer, L. H. Brown, ceramic assistant, H. W. Hepplewhite, ceramic assistant, and H. M. Kraner, laboratory aid.

ADDITIONAL ROOM AND EQUIPMENT.

The University of Ohio assigned another room 18 by 22 feet to the Columbus station, which has been fitted up for a library, reading room, and drafting room. The additional room makes a total of 14 rooms for the use of the station.

The equipment added to the station consists of a Riehle testing machine, potter's wheel stand, four steel clothes lockers, a high temperature combustion furnace, a Hoskins electric furnace, an electric buzzer system, two Maxon premix gas burners, camera and outfit, petrographic microscope, a set of laboratory rolls for crushing ceramic materials, pyrovoltar and a hydropneumatic press.

Investigations of the year included continuations of work undertaken during the preceding year on physical properties of white clays east of the Mississippi River as compared to imported clays;

tests on clays for the United States Geological Survey; cooperative investigation of Ohio fire clays; crucible-making properties of domestic-bond clays and graphites as compared to the foreign; properties of dolomite as a refractory for furnace linings. During the fiscal year investigations were commenced on brick suitable for malleable-iron furnace bungs; load tests of fire brick at furnace temperatures; luster compositions for pottery decoration; and physical properties of two California clays.

WHITE CLAY INVESTIGATION.

The principal uses of white clays known as kaolins and china clays are for the manufacture of pottery and as fillers for paper, oilcloth, and paint. In 1918 over 48 per cent of the amount used in the United States was imported, most of it coming from England. The bulk of the English china clay is used in the better grades of pottery, paper, and oilcloth.

In order to ascertain the comparative adaptability of domestic and foreign clays, the Columbus station in 1918 undertook the investigation of the white clays east of the Mississippi River, and has continued the work throughout the past year. Nearly 100 clay samples were gathered in the field and delivered to the station for tests. About 70 of these samples were collected by a representative of the Bureau of Mines and 30 by representatives of the United States Geological Survey. In this work the physical properties of the clays have been carefully studied in order to determine wherein they differ from the best English clays and to discover, if possible, how domestic clays may be improved by better mining, refining, and blending methods in order to place them on a par with the imported clays. The plasticity, drying, and burning behaviors, strength, color, shrinkage, porosity, fusion temperature, and behavior in pottery bodies are under investigation. The microscopic study indicates that the colloidal matter in the English clays is composed largely of crystalline particles, whereas the colloidal constituents of the American clays are largely amorphous.

Improvement in the desirable physical properties of the American clays by inexpensive physical and chemical treatments will broaden their usefulness and be instrumental in replacing imported clays.

COOPERATIVE INVESTIGATION OF OHIO FIRE CLAYS.

A cooperative agreement between the Bureau of Mines and the Ohio State Geological Survey was made in order to undertake a survey of the fire clays of the State. This agreement is substantially a part of the agreement between the bureau and the University of Ohio. During the war the increase in the production of metals

created a demand for No. 1 fire brick for furnace linings greater than the fire-brick manufacturers could supply. An analysis of the situation indicated that comparatively little information was available in regard to the location, quality, and extent of our fire-clay resources. Had such information been available, it would have relieved the war-time shortage of fire-clay refractories. The cooperative work on the fire clays of Ohio is a start in obtaining much needed data on domestic fire clays, and similar cooperative agreements with other States are invited. The work on the Ohio fire clays is about equally divided between the bureau and the State geological survey. The survey is doing the field work in collecting the samples, is obtaining data on the location, extent, and geological formations, and is making the chemical analyses of the samples collected. The Columbus station will make the physical tests and determine the value of the different clay samples for refractory purposes.

BOND CLAYS AND GRAPHITES FOR CRUCIBLES.

Prior to 1914 the majority of graphite crucibles were made from imported graphite, chiefly Ceylon, and German Klingenberg bond clay. It was considered that the Ceylon graphite, bonded with Klingenberg clay, produced a crucible superior to crucibles made from domestic materials. Early in 1918 the investigation of American bond clays and graphites was undertaken by the Columbus station to determine the crucible-making properties of these in comparison to the foreign. As the strength of the crucible depends on the physical properties of the bond clay, it is more disastrous to use an inferior bond clay than an inferior grade of graphite. The crucible work consists of two principal phases, the investigation of bond clays and the investigation of the graphites.

The investigation of the bond clays was first undertaken and has been completed during the past year. Eighteen domestic clays, one English clay, and the German Klingenberg clay were investigated, and in this work 15,000 test pieces, physical measurements, and calculations were made.

In order to apply the laboratory results to working practice, over 200 No. 70 size brass-melting crucibles and 100 No. 60 size steel-melting crucibles were made and tested under actual foundry practice. These tests were made possible by the cooperation of the Vesuvius Crucible Co. of Swissvale, Pa., the Detroit Lubricator Co. of Detroit, Mich., and the Simonds Manufacturing Co. at Lockport, N. Y.

The results of the work on bond clays indicate that better crucibles can be made from the domestic clays than from those hitherto imported and that the graphite-crucible manufacturers are independent

of foreign clays. The argument that Klingenberg clay is essential for the production of crucibles of highest service is not borne out by these tests. Work on the tests of the different foreign and domestic graphites has been delayed by difficulties in obtaining deliveries of large-sized representative samples of three of the eight different graphites to be tested.

In the work on the behavior of the different graphites in crucibles, the results of the work on the bond clays has been used as a guide. Clay bonds for the brass and steel melting crucibles have been selected as standards in order that the tests on the crucibles made from the different graphites may show high scores and at the same time be comparable.

PROPERTIES OF DOLOMITE AS A REFRACTORY FOR FURNACE LININGS.

Before 1914 more than 80 per cent of the magnesite refractories for furnace linings were made from Grecian and Austrian magnesite. During the war it was impossible to obtain magnesite from Austria. Imports from Greece practically stopped, and manufacturers had to draw on the Canadian and United States magnesites. The available supply in the United States is confined almost entirely to the States of Washington and California. Approximately 90 per cent of the magnesite refractories are used for furnace linings in metallurgical operations east of the Mississippi River. The steel mills are the largest users of magnesite refractories.

Magnesite for the manufacture of refractories has to be calcined at a temperature high enough to dead burn it or render it "non-slacking." To dead burn pure magnesite effectively requires such an intense heat that it can only be accomplished in the electric furnace at a comparatively high cost. The magnesite of the Pacific Coast States is so pure that it has to be ground with an addition of iron oxide before it can be dead burned in combustion rotary kilns. Owing to cheap European labor, ease of dead burning and water transportation, the Austrian and Grecian magnesites can be delivered to points in the United States east of the Mississippi cheaper than the dead burned magnesite from the Pacific Coast States can be delivered to the same points.

As far as can be learned, a commercial dolomite fire brick that will stand storage for a year or more without showing signs of disintegration has never been made. A dolomite fire brick that will compare favorably with a magnesite brick in service and will stand storage indefinitely, will be the means of developing a new industry, and will utilize an inexhaustible raw material of low initial value.

The investigation of dolomite was undertaken in 1918 and is approximately 90 per cent completed. Various patented methods of

producing so-called dead burned dolomite and a number of methods devised by the Columbus station have been investigated. The two important phases of the investigation are (1) suitable dead-burning agents, and (2) proper heat treatment during the dead-burning process.

Tests have been made on the addition of different percentages of such dead burning agents as basic slag, acid slag, hematite, roll scale, surface clay, kaolin, bauxite, and different chlorides. The different percentage mixtures of dolomite and reagent were calcined at different temperatures from 1,350° C. up to 1,750° C. and the resistance of the products to air slaking or disintegration observed when the trial pieces were stored in the open air at room temperature. Several trial pieces have been under observation for more than a year without showing signs of disintegration. The most promising results thus far obtained are with test pieces made from 80 per cent dolomite ground with 20 per cent roll scale and calcined to 1,410° C.

It is the lime content of dolomite that hinders dead burning. Early in the year the Columbus station began experiments in removing the lime from dolomite by calcining the rock at different temperatures, hydrating and separating the lime by flotation. In laboratory scale tests, the lime in Cedarville dolomite was reduced from 56 per cent to 25 per cent, the lime being recovered as a by-product.

LOAD TESTS OF FIRE BRICK AT FURNACE TEMPERATURES.

Inquiries are received from time to time by the Columbus station for data on the load-carrying capacity of fire brick at furnace temperatures. The use of brick made from such materials as zirconia, zirkite, spinel, sillimanite, and silicon carbide for furnace linings is beginning to attract attention. In order to obtain data on the load-carrying capacity of these comparatively new refractories, the station has made tests of zirconia and silicon-carbide brick and will test the others. In the load test at furnace temperatures the zirconia and silicon carbide brick withstood several times the load of clay fire brick at the same temperatures.

LUSTER COMPOSITIONS FOR POTTERY DECORATION.

Most of the luster compositions used by pottery manufacturers and ceramic studios are purchased in prepared form ready for use, and the larger part of these are imported from England, France, and Germany. In order to stimulate domestic production of such colors and to disseminate information in regard to them, the Columbus station has investigated 48 different compositions. These lusters were applied over a hard-fired porcelain glaze, and fired at different temperatures from 550° C. to 1,000° C. in a muffle kiln.

The permanency of the lusters was tested by applying a buffer wheel at a constant pressure to the luster surface and rotating it at 1,330 revolutions per minute for 10 minutes. Lusters standing this treatment without rubbing off enough to allow the glaze to show through were considered "durable." Temperatures between the ranges of 600° C. to 1,000° C. were required to produce durable lusters. Metallic lusters, like platinum luster, must be fired about 800° C. in order to be durable. Lusters that produce more of a color than luster effect often adhere thoroughly when fired to 600° C.

PHYSICAL PROPERTIES OF TWO CALIFORNIA REFRACTORY CLAYS.

During the year 1913 approximately 25,000 tons of glass pot clays were imported, principally the Gross-Almerode clay from Germany. This clay is highly siliceous, very plastic, has high bonding strength, and is comparatively low in iron content. It therefore is not readily corroded by the molten glass, gives a glass pot of high strength, and does not impart a perceptible color, due to iron, to the glass.

The General Land Office submitted two small clay samples from the region of Ontario, Calif., to the Columbus station for tests. These tests indicated that the clays were very plastic, highly siliceous, of good refractory qualities, and of comparatively low burning shrinkage. Consequently samples of about 100 pounds each were received and more thorough tests made. The chemical analyses of the two California clays show a close similarity to the analysis of the Gross-Almerode clay, but the bonding strength over firing temperature and fusion temperature of the California clays are superior to those of the Gross-Almerode clay.

PAPERS PRESENTED FOR PUBLICATION.

Papers on the following subjects by members of the Columbus staff were presented at the meeting of the American Ceramic Society in convention at Philadelphia, February 23 to 26, 1920; permission was granted by the director for their publication in the journals of the society: By H. G. Schurecht, "Elutriation tests on American kaolins," "A direct-reading overflow volumeter," "Experiments with aventurine glazes," "Behavior of fire brick in malleable-furnace bungs," and "Experiments in dead-burning dolomite and magnesite"; by H. W. Douda, "The effect of wet grinding, screening, and electrolytes on clays of low plasticity," and "Tests on California refractory clays"; by R. T. Watkins, "Some luster pottery decorations"; by R. N. Long, "The fusibility of mixtures of graphite, ash, and bond clays"; and by R. T. Stull, "Behavior of bond clays in graphite crucibles under brass and steel melting practices."

A paper by R. T. Stull, entitled "Bond clays and graphites for crucible-making purposes," was presented at the convention of the American Mining Congress in St. Louis in October, 1919.¹

FAIRBANKS STATION.

J. A. Davis, superintendent of the Alaska station, in addition to his other duties, assisted the Alaska section of the American Mining Congress in studying the power requirements of a central plant in the Nenana lignite field to supply power for mining in the interior of Alaska. A bill providing for the establishment of such a plant was forwarded to the American Mining Congress at Washington for presentation to the United States Congress.

During the latter part of the year Mr. Davis spent some time in the United States on matters connected with the power-plant report and other problems.

Work conducted by the station during the year is described below.

STEAMING AND WEATHERING TESTS OF ALASKA LIGNITE.

The Fairbanks, Alaska, station completed two series of tests on the comparative steaming value of Alaska lignite and spruce wood, and on the resistance of lignite to weathering when stored in piles in the open air. The tests were made under the direction of John A. Davis, superintendent of the station, assisted by Paul Hopkins, chemist, and John Gross, metallurgist. These investigations are of especial interest as showing on what grade of fuel cheaper power for the mining industry of that district depends.

The steaming tests were conducted at the power plant of the Alaska Engineering Commission at Nenana, the boiler used being one of a battery of two horizontal boilers, each rated at 125 boiler horsepower. Similar boilers are used at many Alaska mines. Two grades of lignite, one from the Lynn mine and one from the Burns mine, and one grade of spruce wood were tested. The results showed that, under the test conditions the heating value of spruce wood, pound for pound, lay between the two samples of lignite, but that a cord of the wood is equivalent to more than a ton of either lignite. Steaming tests of Nenana lignite from other mines are under way.

In the weathering tests several hundred pounds of Nenana lignite, crushed and sized, was placed on the roof of the station, where it was exposed to the weather for 14 months. The results showed that the surface layer of lignite in unprotected piles disintegrates, but the material beneath undergoes little change, these lignites behaving in substantially the same manner as those of North Dakota.

¹ Proc. 22d Annual Convention, Am. Min. Cong.

METALLURGICAL WORK.

Much assistance was rendered mine operators by milling tests of ores submitted and by personal inspection and advice on milling problems.

The metallurgical work is under the direction of John Gross, metallurgist.

MILLING TESTS OF "BLACK SANDS."

A more efficient method than barrel amalgamation is badly needed for Alaskan placer gold mines, as the method does not yield more than half the gold in the "black sand" from clean-ups. Various samples of "black sands" from placer sluice boxes were subjected to milling tests to find methods of separating the gold from the gangue, by classification, concentration, and amalgamation. On black sand from Goldstream, methods of treatment were worked out that gave gold recoveries of more than 97 per cent. Low-grade black sand from Fairbanks Creek containing a large proportion of magnetite (about 90 per cent) was effectively treated by combining electromagnetic separation with gravity separation. A satisfactory recovery by simple apparatus that could be cheaply installed at the mine was developed.

Concentration tests are under way on black sand from Eva Creek. This sand contains native bismuth associated with the gold, which is difficult to separate and causes trouble in amalgamation.

TESTS OF MILL TAILINGS.

A sample of tailings from a small mill on St. Patricks Creek was treated by amalgamation and cyanidation to obtain data on milling losses in the district and to assist the owners in selecting a proper treatment of ore for a contemplated mill. The sand, which had been treated by amalgamation at the mine, was found to contain about 11 cents gold per pound. The tests showed that by concentration and cyanidation, after amalgamation, nearly all of the gold could be saved.

LOW-GRADE LEAD-COPPER-SILVER ORE.

Low grade silver ore from Kantishna, in which galena and gray copper are associated with silver, in a siderite gangue, is being tested in an endeavor to find a practical method of separating the silver, lead, copper, and iron minerals.

Concentration tests of low-grade gold-antimony ores from Nome were made as an incentive to the development and mining of the deposits in that district. The presence of the antimony makes the ore practically worthless as gold ore, and, on the other hand, smelters do not pay for gold in antimony ore. Preliminary tests showed that

separation of the minerals in two separate stages was necessary. Therefore tests were made to determine whether removing the gold by cyanidation and then dissolving out the antimony with a solution of caustic soda is practicable. A partial recovery of the gold was obtained and removal of antimony seems feasible. Further work needs to be done on this problem.

COPPER-PYRRHOTITE ORES.

Experiments at the Alaska station on the separation of copper from pyrrhotite in ores from La Touche indicate that more than 75 per cent of the copper can be recovered by chloridizing and volatilization. Microscopic study of the ore by F. B. Laney of the Salt Lake station showed that mechanical separation of the copper, which is in the form of chalco-pyrite, is impossible on account of its minute dissemination through the pyrrhotite and other gangue minerals.

SAMPLING AND ASSAYING.

A large amount of assaying was done in connection with the milling tests. Also many customs assays, chiefly for gold and silver, were made for prospectors and others, as well as mineralogic examination of specimens submitted.

At the request of the Alaska Engineering Commission deliveries of coal at Nenana were sampled and analyzed.

The sampling and analytical work is done by Paul Hopkins, chemist.

GOLDEN STATION.

Dr. S. C. Lind, superintendent of the Golden station, in addition to his administrative duties, personally conducted the experimental work on radium and uranium, and prepared a series of articles on methods of determining radium which were published in the Journal of Industrial and Engineering Chemistry.

Prior to November 1, 1919, Dr. R. B. Moore was superintendent; he devoted his time largely to the research on helium, described in another section of this report.

RADIUM.

CHEMICAL EFFECTS OF RADIUM EMANATION.

Dr. Lind is conducting a new series of experiments on the chemical effects of radium emanation in gas reactions. Improved apparatus was installed for eliminating hydrogen and oxygen gases from the emanation, with additional equipment for final purification by liquid air. In a study of the combination of hydrogen and oxygen pro-

duced by α particles, it was discovered that the recoil atoms also produce chemical action proportionate to the ionization.

REDETERMINATION OF THE SPECTRUM OF THE RADIUM EMANATION.

In cooperation with Prof. R. E. Nyswander, of Denver University, Dr. Moore and Dr. Lind continued the work of redetermining the spectrum of the radium emanation. A number of lines have been successfully photographed and measured, and their identity as part of the spectrum has been established with certainty; some of these coincide with the principal lines observed by other authorities, and the rest are apparently new lines.

Some work was also done in photographing the spectral lines of krypton and xenon furnished and purified by Dr. Moore.

REDETERMINATION OF RADIUM-URANIUM RATIO.

Dr. Lind, of the station, and Prof. L. D. Roberts, of the Colorado School of Mines, concluded their investigation on the redetermination of the radium-uranium ratio, which they found to be $3.40 \times 10^{-7} \pm 0.03$. Results were published in June (1920) number of the Journal of the American Chemical Society.

Dr. Lind also prepared the third section of a series of papers on methods of determining radium, published in the Journal of Industrial and Engineering Chemistry. The paper deals especially with improvements in electroscopes in recent years, and use of the X-ray electroscope in examining radioactive ores and other radioactive products.

RADIUM FRACTIONATION.

Dr. Moore and Dr. Lind assisted the officials of the Minerals Recovery Co., of Denver, in overcoming difficulties they have experienced in radium fractionation. This company purchased and is operating the plant for treating carnotite ores built by the National Radium Institute.

LUMINOUS PAINTS.

Experimental study of the properties of radium luminous paint continued throughout the year. Photometers for luminosity measurements were standardized, and a table prepared to convert the readings in centimeters into microlamberts.

A method was worked out for the preparation of pure zinc sulphide, and a quantity of the pure nonluminous salt was obtained. The action of radium emanation on the pure salt is being studied, and this study will be continued on the prepared phosphorescent

VANADIUM.

HEWITTITE.

J. E. Conley made an analytical study of a vanadium mineral for the Colorado State Bureau of Mines. The mineral proved to be hewittite.

RECOVERY OF VANADIUM FROM CARNOTITE TAILINGS.

There is a large tonnage of tailings at the Denver plant formerly operated by the National Radium Institute in treating carnotite for radium and uranium. J. E. Conley is studying the problems of recovering the vanadium contained in these tailings.

ZINC DESCLOIZITE.

Zinc descloizite, a zinc, lead, and vanadium mineral, has not been treated commercially in this country. As a continuation of his work on "cuprodescloizite" and vanadinite, Mr. Conley studied the metallurgy of zinc descloizite, of which workable deposits of reasonable size are found in Nevada.

The experimental work has shown that the common method of extracting vanadium by acid leaching and alkaline roasting, or fusion with subsequent leaching, is not suitable to this ore, which because of its large content of calcium uses up too much acid and alkali. Smelting to remove the lead, as in ordinary lead smelting, and then directly preparing ferrovanadium from the slag, has resulted in a recovery of 75 per cent of the vanadium. Also experiments in passing dry chlorine gas over reduced ore at low temperatures resulted in the volatilization of about 85 per cent of the vanadium. The experimental work is still under way.

ZIRCONIUM.

Dr. J. W. Marden, associate chemist, and Mr. Rich completed a bulletin on "Zirconium, its properties and methods of preparation," and submitted it for publication. A preliminary publication was made in the July (1920) issue of the Journal of Industrial and Engineering Chemistry.

MOLYBDENUM STEEL.

The Golden station, in cooperation with the Primos Chemical Co., of Primos, Pa., and with the Colorado School of Mines, is studying the preparation, properties, and uses of molybdenum steels, with the object of arriving at the best conditions under which duplication of steels of definite composition can be obtained. The work is under the direction of R. Keeney, of the Colorado School of Mines.

MOLYBDENITE ORE.

Mr. Bonardi made small-scale experiments on molybdenite ore from Questa, N. Mex., and found it amenable to flotation. The results have established the necessary factors for obtaining high recoveries and a good grade of product.

The flotation of molybdenite-chalcopryrite ores was studied with encouraging results. Reagents were obtained which render chalcopryrite nonfloatable and the molybdenite floatable, with a recovery of about 85 per cent. A study is being made of the chemical effects of oxidizing agents on the ore, oil, and minerals.

NICKEL SULPHIDE ORES.

C. W. Davis has studied methods of sulphatizing roasting of nickel-sulphide ore. A 3-per cent ore from Chichagof Island, Alaska, was roasted and sulphatized, the gases being repassed over the ore at lower temperatures. Results with additional SO_2 showed 85 per cent recovery, but SO_2 obtained by roasting the ore was not enough to sulphatize completely.

DETERMINATION OF PLATINUM IN ORES.

There is need in the platinum industry of standardizing methods of assaying platinum in order that similar results can be obtained in different laboratories.

C. W. Davis studied methods of assaying platinum in ores, and prepared a paper on the subject. The paper gives the results of his experimental work on the different gravimetric and volumetric methods, describes these methods and the factors needed to insure accurate results in applying them in the laboratory.

COOPERATIVE WORK WITH STATE OF COLORADO.

Under a cooperative agreement with the State of Colorado, a survey is being made of the complex and low-grade ores of the State. The State has appropriated \$15,000 for the work, the purpose of which is a field survey and investigation of the method of treatment of the complex ores of Colorado carrying lead, zinc, copper, silver, and gold.

R. R. Hornor and B. C. Essig are conducting the field work and collection of samples; E. V. Ingles was appointed analyst under the State appropriation and has been engaged in analyzing samples submitted. J. C. Williams is aiding in the metallurgical work, and W. H. Coghill is working on the separating of lead and zinc by flotation.

METHODS OF ANALYZING RARE METALS.

A bulletin on methods of analyzing rare metals was submitted for publication. Practically all the members of the station were engaged in this work.

MINNEAPOLIS STATION.**IRON-MINING METHODS.**

The study of mining methods on the Lake Superior iron ranges, by C. E. Julihn, superintendent, and G. E. Ingersoll, metal mining engineer, was continued throughout the year.

Field work on the Mesabi Range, which included the equipment and methods employed in mining and concentrating the ores, was completed.

INVESTIGATION OF LOW-GRADE IRON ORES.

In connection with the field work on the iron ranges, information is being compiled on the low-grade ore reserves, samples of which are collected from various stock piles and dumps, for beneficiation tests. The mines experiment station of the University of Minnesota cooperates in these tests.

EXPERIMENTAL BLAST FURNACE.

An experiment blast furnace was erected at the Minneapolis station, under the direction of P. H. Royster, assistant physicist, aided by T. L. Joseph, assistant metallurgist, and others. This furnace is now in blast intermittently.

The tests at present have as an object the determination of possible methods for the utilization of low-grade manganese ores now available in the United States. Incidentally a comprehensive record of fundamental data on blast furnace smelting is being made. The scope of this work will be extended to include work with reference to the smelting of iron.

HEAT TREATMENT OF DRILL STEELS.

Various conferences were held with scientists and operators interested in the problem of the heat-treatment of drill steels. Samples of drill steels are being collected preparatory to a laboratory study of their heat-treatment. This work was conducted by C. E. Julihn.

TESTS OF FUELS IN DOMESTIC HEATING EQUIPMENT.

A building equipped with furnace and heating plant was erected for the purpose of conducting tests of heating apparatus and fuels in house heating.

In October J. J. McKitterick took charge of this work. A series of tests of fuels for house heating was begun, starting with by-product coke. A nine-week test with a steam house-heating boiler of 575 square feet radiating capacity was made with coke, anthracite, and bituminous coal. A similar series was conducted with an apartment-house boiler of 1,600 square feet radiation capacity. Other house-heating units received some study. These included various stoves and grates.

These tests had as an object the collection of precise data upon the relative value of coke as compared with other fuels.

A report of the results is being prepared by Mr. McKitterick.

REMOVAL OF PHOSPHORUS IN IRON ORES.

Large quantities of iron ore in the United States are too high in phosphorus for direct smelting, but a cheap method of removing the phosphorus would render these ores available. In order to determine whether enough of the phosphorus in medium or high phosphorus ore could be leached out to make the ore of smelting grade, the station made a number of tests. The experiments, by C. E. Plummer, indicated that leaching was not practicable, and the work was discontinued.

DETERMINATION OF PHOSPHORUS IN IRON ORES.

Mr. Plummer studied methods for determining the amount of phosphorus in iron ore, this work being in response to requests from buyers and sellers of iron ore who complained of difficulty in securing analyses that would check closely. A paper on this subject is in course of preparation.

MISCELLANEOUS.

R. P. Royster and T. L. Joseph prepared a paper on conditions affecting efficiency of coke in modern blast furnaces, and worked on a bulletin on modern blast-furnace practice.

A large number of routine analyses of iron ores, slags, steels, and other alloys were made in the chemical laboratory by C. E. Plummer.

PITTSBURGH STATION.

The work of the Pittsburgh station may be grouped under general heads as follows: Testing of explosives, testing of explosibility of coal dusts, coal-mining investigations, electrical equipment in mines, mine-safety and rescue work, metallurgy of nonferrous metals, petroleum analytical laboratory, tests of fuels, electrical, and mechanical equipment, and chemical research laboratory.

MINING INVESTIGATIONS.

The mining investigations conducted at the Pittsburgh station include studies of coal-mining methods, mine explosions, and mine hazards; tests at the experimental mine at Bruceton, Pa., such as physical testing of explosives, tests of explosibility of coal dusts, experiments on the preparation and use of liquid-oxygen explosives, and experiments with geophones for mine work; and the investigation of motor gases in vehicular tunnels. All of these, except the testing of explosives, have been described under the work of the mining division, on pages 32 to 39 of this report.

PHYSICAL TESTS OF MINE EXPLOSIVES.

Physical tests of explosives are made at the explosives experiment station, near Bruceton, Pa. The testing work was in charge of S. P. Howell, explosives engineer, aided by J. E. Crawshaw, explosives testing engineer; J. E. Tiffany, assistant explosives engineer; E. Stein, assistant explosives engineer; R. Y. Colclessor, assistant explosives engineer; J. A. Farr, assistant explosives engineer; A. B. Coates, assistant mechanical engineer; and W. J. Montgomery, assistant explosives engineer.

During the year 34 new explosives were added to the permissible list and 17 removed. On June 30, 1920, the list contained the names of 179 explosives, as compared with 162 on June 30, 1919.

A digest of the rules, regulations, and practices governing the testing of explosives by the Bureau of Mines, and their placement on the permissible list was prepared by S. P. Howell, explosives engineer. Also a critical study of strength tests of permissible explosives is being made in order to determine their importance and necessity, and to discard any not of direct value.

SPECIAL TESTS AND INVESTIGATIONS OF EXPLOSIVES.

The special tests and investigations made during the year are mentioned below:

NEUMANN BANDS IN STEEL.

In cooperation with the National Research Council, the explosives section prepared steel disks by submitting them to impact of explosives of different rates of detonation and weights, falling from different heights. These disks were then examined, for Dr. H. M. Howe, for the Neumann bands produced. It was found that within certain limits the number and character of Neumann bands in steel varied with the velocity of the impact that produced them. This work was done by S. P. Howell, explosives engineer.

EFFECTS OF TEMPERATURE ON CRYSTALLIZATION OF AMMONIUM NITRATE.

The cooperative work with the Aetna Explosives Co. on the effects of the crystallizing temperature of ammonium nitrate on the safety and strength of permissible explosives continued during the year. The work is being done by J. E. Crawshaw, explosives testing engineer.

APPLICATION OF MILITARY EXPLOSIVES TO COMMERCIAL PURPOSES.

At the time the armistice was signed, the War Department had on hand many millions of pounds of military explosives, which it has since desired to adapt to commercial purposes, and the explosives section of the Bureau of Mines was called upon to demonstrate their adaptability and to make recommendations. The explosives investigated were TNT, picric acid, Trojan grenade powder, Grenite, and two samples of black military powders. A mineographed pamphlet describing the use of TNT entitled "TNT as a Blasting Explosive," by Charles E. Monroe and Spencer P. Howell, was prepared and distributed. The entire section participated in these tests.

FLAME TESTS OF BLACK BLASTING POWDER.

Flame tests of special grades of black blasting powder were made for the Picatinny Arsenal, at Dover, N. J., by W. J. Montgomery.

FIELD TEST FOR TRITON BLOCKS AND STICKS FOR UNITED STATES ENGINEERS.

At the request of the United States Engineers, the explosives section developed a field test for Triton block and stick explosive. Several series of tests were performed and a field test, which has been adopted as part of the specifications for Triton blocks and sticks, was recommended to the Chief of Engineers. This work was carried out by J. E. Tiffany.

PRODUCTS OF COMBUSTION OF TNT.

An investigation of the products of combustion of TNT (grade I) under different conditions of loading and pressure was begun and will be continued during the next fiscal year by J. E. Crawshaw and A. B. Coates.

DESENSITIZING EXPLOSIVES.

Tests were made on TNT and picric acid to determine suitable substances with which they can be mixed in order to render them insensitive while being stored, thus increasing safety during their transportation and storage in large quantities. The work was done by E. Stein.

EASE OF IGNITION OF BLACK BLASTING POWDER IN KEGS.

Tests were made to determine the ease of ignition of black blasting powder in metallic kegs, either by open-flame miners' lamps or bare electric cables, several serious accidents being attributable to either of these two factors. It was found that black blasting powder can be readily ignited by these means. The tests were made by W. J. Montgomery.

SPECIAL TESTS OF GROUND SMOKELESS-POWDER DYNAMITES.

At the request of the Ordnance Department tests were made to determine certain physical properties of dynamite containing ground smokeless powder. A knowledge of this type of explosive is of great value to the Ordnance Department as a means of disposal of surplus smokeless powder.

EXPLOSIBILITY OF DINITROTOLUOL WHEN HEATED IN CONTACT WITH IRON.

Tests showed that DNT when heated in contact with iron is an explosive. This knowledge is important because of the inflammability of DNT and its wide use in the dye industry. This work was performed by W. J. Montgomery.

TNT MANUFACTURED BY THE "CELLITE" PROCESS.

Investigation of the cause of the deterioration of certain samples of Cordeau-Bickford fuse showed that deterioration was due to the use of TNT manufactured by the "Cellite" process. The explosives section has been requested to investigate TNT manufactured by the "Cellite" process and will continue this investigation during the coming fiscal year.

PENDULUM-FRICTION TESTS OF MERCURY FULMINATE MIXTURES.

At the request of the Ordnance Department of the Army a series of tests were carried out to determine the sensitiveness to frictional impact of mercury fulminate and mercury fulminate-potassium chlorate mixtures. Mercury fulminate and mercury fulminate-potassium chlorate mixtures proved more sensitive than any explosive previously tested. The tests were made by A. B. Coates.

INVESTIGATIONS OF EXPLOSIONS.

Investigations were made to determine the causes of the following explosions:

1. Ignition of 3F black blasting powder in the Wolf Run mine, of the Wolf Run Coal Co., Amsterdam, Ohio, September 8, 1919, by J. E. Tiffany.

2. Outrages with explosives incident to strike of Louisville Street Railway Co. in September, 1919, by S. P. Howell.

3. Disaster due to improper handling of a misfired shot in the clay mine of the Union Clay Manufacturing Co., Empire, Ohio, October 3, 1919, by J. E. Tiffany.

4. Disaster due to drilling into an unexploded charge in shaft of Mine No. 8 of the Pittsburgh Terminal Railroad & Coal Co., October 13, 1919, by J. E. Tiffany.

5. Explosion on April 19, 1920, at Mill A quarry of the Lehigh Portland Cement Co., at Ormrod, near Allentown, Pa., by J. E. Crawshaw.

6. Investigation of a premature explosion of nitroglycerin near the Sistersville magazine of the Young Torpedo Co., Sistersville, W. Va., by J. E. Crawshaw.

INSPECTIONS OF TNT AND TROJAN GRENADE POWDER.

J. E. Tiffany inspected the conditions of grade III TNT and Trojan grenade powder at the general ordnance depot of the Army, at Charleston, S. C., on May 8, 1920. He found that the Trojan grenade powder was unsuitable for use in road building, but could be successfully employed for that purpose when used in equal proportions with TNT.

S. P. Howell, on June 21, inspected TNT in storage at the general ordnance depot of the Army, Sparta, Wis.

MINE-RESCUE AND FIRST-AID WORK.

D. J. Parker, mine-safety engineer, with headquarters at Pittsburgh, supervised the work of the safety stations and rescue cars. This work has been described elsewhere (p. 130).

ELECTRICAL AND MECHANICAL EQUIPMENT IN MINES.

The electrical section, under L. C. Illsley, electrical engineer, conducted tests of electrical appliances for safe use in gaseous mines, and of gas detectors for determining carbon dioxide, carbon monoxide and oxygen in mine air.

The mechanical equipment section, under R. H. Kudlich, mechanical engineer, conducted tests of safety gates in mines, wire ropes, hoisting ropes, and safety catches.

These investigations have been mentioned in the chapter on the fuels division.

FUELS SECTION.

The work of the fuels section of the Pittsburgh station pertains to the efficient use of fuels in steam boilers and furnaces, the use of powdered coal, of fuel in refining oils, of coke for house-heating pur-

poses, of gas in metallurgical furnaces, and of heat transmission in steam boilers. The section was in charge of Henry Kreisinger, engineer. The section cooperated with the United States Shipping Board in tests of oil burners, and with the Army in tests of fuel-burning equipment. The results have been mentioned under the work of the fuels division.

CHEMICAL RESEARCH LABORATORY.

Investigations of the chemical research laboratory were under the direction of A. C. Fieldner, supervising chemist, and J. D. Davis, assistant supervising chemist. The supervising chemist conducts investigations for all division chiefs, and reports to the supervisor of stations, through the superintendent of the Pittsburgh station. The chemical investigative work of the laboratory is also under the general direction of Dr. R. B. Moore, chief of the division of mineral technology, whose office is in Washington. Dr. G. A. Hulett, of Princeton University, Dr. J. C. W. Frazer, of Johns Hopkins University, and Dr. W. D. Harkins, of the University of Chicago, are on the consulting staff of the laboratory.

The work of this laboratory pertains to coal, coke, by-products, mine gas and natural gas, fuel gases, industrial gas masks, explosives, ventilation in mines, dust explosives in coal mines, rock dust in metal mines, and miscellaneous minerals.

ANALYTICAL LABORATORY.

ROUTINE EXAMINATIONS.

Samples of fuels belonging to the Government and samples of fuels and other materials required in the course of investigations being made by the United States, State geological surveys, and experiment stations are analyzed in the general laboratory at the Pittsburgh experiment station. In the course of this work hundreds of samples of coal, coke, lignite, mine dusts, ash, clinker, fuel oil, soot, tar, ceramic materials, aluminum alloys, and other substances, were received and several thousand determinations were made.

Besides the routine analytical work mentioned above, the laboratory conducted special investigations as follows:

FUSIBILITY OF COAL ASH.

A survey of the fusibility of the ash of various coals throughout the United States was continued. Laboratory tests of the eastern coals were completed, the testing of western coals is still under way. A paper entitled "Fusibility of coal ash from eastern coals" was published.²

² Selvig, W. A., Brown, O. C., and Fieldner, A. C., Fusibility of coal ash from eastern coals: Chem. and Met. Eng., vol. 22, Jan. 14, 1920; Coal Age, vol. 17, Jan. 22, 1920, and vol. 17, Jan. 29, 1920; Power, vol. 50, Oct. 28 and Nov. 4, 1919.

DETERMINATIONS OF GRAPHITIC CARBON.

A standard method for determining graphite carbon in the presence of amorphous carbon, which had previously been determined by uncertain indirect methods, was developed. The results are given in a paper entitled "The problem of determining graphitic carbon."³

COAL-ANALYSES BULLETIN.

A bulletin on the analyses of coals collected in the United States during the fiscal years 1916-1919, a continuation of the work described in Bulletins 22 and 85, was submitted for publication.

ALUMINUM ANALYSIS.

The present chemical work on aluminum analysis includes: (1) Search for a method of determining oxygen in commercial aluminum; (2) study of the methods already in use; (3) study of the effects of oxide and other impurities on the physical and mechanical properties of the metal.

A study of the nature and condition of the atmospheres of the various types of aluminum melting furnaces is in progress. Knowledge of the gases in contact with molten aluminum at high temperatures should shed considerable light on such questions as oxide, nitride, carbide, and dross formation and the resulting losses of metal. A paper on this problem entitled "Inclusions in aluminum alloy sand castings"⁴ has been published. The aluminum analysis investigation was conducted by J. H. Capps, assistant chemist.

PERSONNEL.

W. A. Selvig, assistant chemist, was in direct charge of the analytical laboratory. The personnel during the year included the following men, who were employed for different lengths of time: F. D. Osgood, J. H. Capps, and W. C. Ratcliff, assistant chemists; O. C. Brown, I. S. Guest, B. B. Kaplan, L. R. Lenhart, G. H. Mengel, and A. B. Judson, junior chemists; P. D. Watson and H. I. Bailey, chemical laboratorians; W. E. Surbled, laboratory assistant; L. J. McGrael and Henry Goldberg, coal samplers.

INVESTIGATIONS OF MINE AND FUEL GASES.**ROUTINE EXAMINATIONS.**

The work of the gas laboratory includes analyses of gas and air mixtures used in testing explosives, miners' lamps, gas detectors, and electrical equipment for coal miners; analyses of combustion prod-

³ Selvig, W. A., and Ratliff, W. C., The problem of determining graphite carbon: Trans. Am. Electro-Chem. Soc., 37th general meeting, Apr. 8 to 10, 1920.

⁴ Anderson, R. J., and Capps, J. H., Inclusions in aluminum alloy sand castings: The Foundry, vol. 48, pp. 337-342, May 1, 1920.

ucts of explosives, gas and air from oxygen breathing apparatus and respirators, fuel gases from fuel combustion investigations, exhaust gas from motor vehicles, and miscellaneous gases from other sources. During the year 3,321 samples of gas were analyzed, involving 30,824 determinations.

ANALYTICAL METHODS.

Data were collected regarding methods of gas analysis, using various types of apparatus for gas analyses, for publication in the "Gas Chemists' Handbook," and also as a Bureau of Mines bulletin.⁵

CHLORINATION OF NATURAL GAS.

The action of various substances as catalysts for chlorinating natural gas and thus producing carbon tetrachloride, chloroform, and methyl chloride, was studied and a report was submitted for publication as a technical paper. Preliminary results of this investigation are given in a technical paper⁶ and in an article entitled "Carbon tetrachloride, chloroform, and methyl chloride from natural gas."⁷

DETERMINATION OF OXIDES OF NITROGEN.

A colorimetric method was developed for the detection of oxides of nitrogen in mine atmospheres. The results of this investigation are to be published in a technical paper of the Bureau of Mines.

AIR FROM METAL MINES.

Samples of air collected from western metal mines by mining engineers of the bureau and by surgeons of the health service were analyzed to determine whether gases from explosives used in mining were present in sufficient quantity to affect health. The tests indicated that in general the percentage of harmful gases was negligible, although in poorly ventilated places the percentage might be important.

FUMES FROM FURNACES MELTING CYANIDE PRECIPITATE.

Examination of fumes from a furnace used in melting cyanide precipitate at Tonopah, Nev., showed no cyanogen or hydrocyanic acid, but indicated that the fumes contained 0.0039 zinc oxide per liter of gas. A mask was recommended for removing the zinc fumes from the air breathed.

⁵ Fieldner, A. C., Jones, G. W., and Allison, V. C., Methods for Gas Chemists' Handbook, chapter on gas analysis.

⁶ Jones, G. W., Allison, V. C., and Melghan, M. H., The chlorination of natural gas: Tech. Paper 255, Bureau of Mines.

⁷ Jones, G. W., and Allison, V. C., Carbon tetrachloride, chloroform, and methyl chloride from natural gas: Jour. Ind. and Eng. Chem., vol. 11, 1919, p. 639.

PERSONNEL.

Gas analyses were in charge of G. W. Jones, assistant chemist, aided by V. C. Allison, assistant chemist, and W. L. Parker, L. J. Trostel, J. C. Bubb, and M. H. Meighan, junior chemists.

EXPLOSIVES CHEMICAL LABORATORY—ANALYSES AND RESEARCH.**ROUTINE INVESTIGATIONS.**

The explosives chemical laboratory analyzes all explosives submitted by manufacturers for tests to determine their permissibility for use in gaseous or dusty coal mines, or their suitability for other industrial uses. The laboratory also analyzes and inspects samples of explosives submitted by other departments of the Government, miscellaneous explosive substances and related materials, and it studies methods of testing, analyzing, and preparing explosives and related substances.

NITRATION OF CORN-COB CELLULOSE.

Experimental work on the nitration of the purified corn-cob cellulose showed that certain difficulties in handling make improbable under ordinary conditions the use of corn-cob cellulose as a substitute for cotton cellulose.

AFTER-CORROSION OF RIFLES.

A thorough investigation of the causes and the prevention of after-corrosion of rifles was carried on in the explosives laboratory as a part of work begun for the Ordnance Division during the war, in cooperation with the petroleum laboratory. More rifles are ruined by corrosion in storage than by any other cause, and the problem has a general interest to all owners of firearms. A number of gun greases were examined in connection with this problem. The causes of corrosion and pitting, and means for prevention were described in an article published in the *Journal of Engineering and Industrial Chemistry*.

NONCORROSIVE PRIMERS.

As a result of the investigation made on the after-corrosion of rifles, it is believed that corrosion would be eliminated if the composition of cartridge primers were changed by omitting potassium chlorate. A study of such a change in composition has been started, and several cartridge manufacturers have been requested to make and test cartridges with primer compositions that will be developed in the explosives laboratory.

ANALYSES OF NITROSUCROSE AND NITROGLYCERIN IN MIXTURES.

An investigation of methods for determining nitrosucrose and nitroglycerin in dynamite was continued; standard dynamites containing nitrosugar, which were carefully prepared by explosives manufacturers in cooperation with the bureau were used. A reliable method is needed because of the increasing use of nitrosugars in explosives. These tests are still under way. Some of the preliminary results are given in a manuscript prepared for publication as a technical paper of the Bureau of Mines.

PARTIAL OXIDATION OF HYDROCARBONS.

Very little work has been done on this problem because of the necessity of prosecuting more urgent research, but the preliminary results were reported in a paper on "The thermal problem in organic contact catalysis."⁸

PERSONNEL.

The explosives chemical investigations were in charge of Dr. Wilbert J. Huff, explosives chemist, assisted by Carl A. Taylor, W. H. Rinkenbach, and L. G. Marsh, assistant explosives chemists, and W. J. Merrill, chemical laboratorian. Other members of the staff for various lengths of time during the year were P. A. Dame, assistant chemist; L. J. Smolen, B. B. Kaplan, J. A. Burmingham, C. C. Fuller, R. D. Leitch, and G. H. Foster, junior chemists.

BRIQUET BINDERS.

J. D. Davis is making a laboratory study of briquet binders.

MICROSCOPIC INVESTIGATIONS.**CONSTITUTION OF COAL.**

The microscopic investigations made at the Pittsburgh station include the examination of explosives, coal dust and rock dust, coal, graphite, miscellaneous materials, and a fundamental study on the constitution of coal. Reinhardt Thiessen, assistant chemist, is in charge.

Mr. Thiessen prepared a paper on "Compilation and composition of bituminous coals";⁹ a paper on "The constitution of coal as seen with a microscope,"¹⁰ read at December, 1919, meeting of the

⁸ Huff, W. J., The thermal problem in organic contact catalysis: *Trans. Am. Electrochem. Soc.*, vol. 36 (1919), pp. 175-194.

⁹ Thiessen, Reinhardt, Compilation and composition of bituminous coals: *Jour. Geology*, vol. 28, 1920, pp. 185-209.

¹⁰ Thiessen, Reinhardt, The constitution of coal as seen with a microscope: *Coal Industry*, vol. 2, 1919, pp. 558-562.

Society of Coal Mining Engineers of America; and a paper on "Occurrence and origin of finely disseminated sulphur in coal,"¹¹ read before the September, 1919, meeting of American Institute of Mining Engineers at Chicago. Also a paper entitled "Problems relating to the chemistry of coal" was prepared and read at the Philadelphia meeting of the American Chemical Society in September, 1919.

TESTS OF GAS MASKS AND INDUSTRIAL GASES.

The gas-mask laboratory conducts special investigations and also tests for the approval of industrial masks, and in addition the laboratory investigates industrial gases, rock dusts in mines, and methods of protection against them.

APPROVAL OF GAS MASKS.

Approvals of gas masks for protection against ammonia have been issued in accordance with the tests prescribed in Schedule 14.¹²

USE OF GAS MASKS IN FIGHTING FIRES.

An extensive investigation of the use of Army gas masks in fighting fires showed that in open-burning fires they serve as efficient smoke filters. In closed rooms, cellars, and other unventilated places, or where artificial gas may escape, the Army mask does not give full protection, on account of failure to remove poisonous carbon monoxide and the possible lack of oxygen in the surrounding air.

A complete report of this investigation has been prepared as a technical paper entitled "Gas masks for gases met in fighting fires."¹³

Other papers on this subject have been published in various technical journals.¹⁴

GASES PRODUCED IN THE USE OF CARBON-TETRACHLORIDE FIRE EXTINGUISHERS.

The investigation of gases produced in the use of carbon-tetrachloride fire extinguishers was completed and the results published in a paper in the Journal of the Franklin Institute.¹⁵

¹¹ Thiessen, Reinhardt, Occurrence and origin of finely disseminated sulphur in coal: Bureau of Mines Bull. 153; Trans. Am. Inst. Min. and Met. Eng., 1919, pp. 2432-2444.

¹² Schedule 14, Procedure for establishing a list of permissible gas masks, fees, character of tests, and conditions under which gas masks will be tested: Bureau of Mines, 1919.

¹³ Fieldner, A. C., Katz, S. H., and Kinney, S. P., Gas masks and gases met in fighting fires: Tech. Paper 248, Bureau of Mines.

¹⁴ Katz, S. H., and Kinney, S. P., Experiences of fire fighters with the Army type of gas masks: Proc. Dominion Assoc. of Fire Chiefs, vol. 11, August, 1919, pp. 106-111; Fire Protection, vol. 62, October, 1919, pp. 24-25; Fireman's Herald, vol. 78, September 13, 1919, pp. 228-229.

¹⁵ Fieldner, A. C., Katz, S. H., Kinney, S. P., and Longfellow, E. S., Poisonous gases from carbon-tetrachloride fire extinguishers: Jour. Franklin Inst., vol. 190, October, 1920, pp. 543-565.

DEVELOPMENT OF A UNIVERSAL GAS MASK.

Experiments are under way for developing a universal gas-mask canister suitable for use with all dry absorbents. Sodium hydroxide is to be used for the alkali.

USE OF GAS MASKS IN RAILROAD TUNNELS.

Tests of various types of masks showed that gas-masks should be very useful to enginemmen for protection against smoke in tunnels. Experiments are being made on the construction of small canisters, with mouthpiece attached, that can be carried in the pocket.

PERMEABILITY OF OXYGEN-BREATHING APPARATUS TO GASOLINE VAPORS.

The death of J. S. Cunningham, foreman miner of the Bureau of Mines, while wearing a half-hour type breathing apparatus in a gasoline storage tank, at Trinidad, Colo., raised the question of the possibility of gasoline vapors penetrating the rubberized fabric of breathing bags. Tests by the Bureau of Mines showed that the thinner bags were rather easily penetrated and that special fabrics should be used for apparatus intended to be worn when entering refinery tanks and similar work. The results were published.¹⁸

CANISTERS FOR PROTECTION AGAINST AMMONIA, GASOLINE, AND SMOKE.

Tests of ammonia-gasoline-smoke canisters were conducted for the Emergency Fleet Corporation. After certain changes recommended by the bureau in the filling of the cans, the canisters passed the tests.

TEST FOR HYDROGEN CYANIDE.

A simple portable testing outfit was designed for use in detecting hydrogen cyanide in low concentrations in air. Such tests are greatly needed in connection with the use of hydrogen cyanide in fumigation and in metallurgy. Cases containing these test papers, with full directions for use, have been turned over to the United States Public Health Service. A paper entitled "Tests for hydrogen cyanide in air" by S. H. Katz and E. S. Longfellow, has been prepared for publication.

SAMPLING AND EXAMINATION OF ROCK DUST IN METAL MINES.

The investigation on methods of sampling rock dust in the air of metal mines was continued. Improved apparatus for the sugar-tube method was developed and assembled for use in the work of sampling

¹⁸ Fieldner, A. C., Katz, S. H., and Kinney, S. P., Permeability of oxygen-breathing apparatus to gasoline vapors. Oil and Gas Journal, Feb. 27, 1920, pp. 78-79; Chem. Eng., vol. 28, February, 1920, pp. 51-52; Jour. Franklin Inst., vol. 189, February, 1920, pp. 251-252.

atmospheres in western metal mines being conducted by mining engineers of the bureau in cooperation with surgeons of the Public Health Service. The dust samples collected are examined and analyzed in the Pittsburgh laboratory.

Papers entitled "Study of the sugar-tube method of sampling dust in air," "Efficiency of the Palmer apparatus for determining dust in air," and "Collection and examination of rock dust," were prepared for publication.

PERSONNEL.

The work on gas masks, industrial gases, and rock dusts was directed by A. C. Fieldner, supervising chemist, aided by S. H. Katz, assistant physical chemist, S. P. Kinney and E. S. Longfellow, assistant gas chemists. G. E. McElroy, of the United States Public Health Service, aided in the rock-dust investigations.

CARBON-BLACK INVESTIGATIONS.

G. St. J. Perrott and Reinhardt Theissen completed an investigation on the constitution, properties, and uses of carbon black, a preliminary report being published in a technical journal.¹⁷ This work was in conjunction with the field investigation of carbon-black plants by R. O. Neal, of the Bartlesville station.

PHYSICAL LABORATORY.

The physical laboratory tests and calibrates physical apparatus and measuring instruments used by the bureau. The instruments calibrated include potentiometers, millivoltmeters, thermocouples, pyrometers, barometers, psychrometers, mercury thermometers, and miscellaneous instruments. F. C. Houghten, assistant physicist, was in charge, aided by P. B. Taylor, junior physicist.

COAL AND COAL PRODUCTS LABORATORY.

METHODS OF ANALYSES FOR FORMS OF SULPHUR IN SPENT OXIDES.

A method was developed for determining the forms of sulphur in spent oxides, this method being for use in the cooperative investigation with the purification committee of the American Gas Association on the improvement of the iron-oxide method for purifying manufactured gas.

SULPHUR IN FUELS.

A. R. Powell, physical organic chemist, completed a study of sulphur forms in coal and prepared a report for publication as a technical paper of the bureau. Experimental work on the changes

¹⁷ Perrott, G. St. J., and Theissen, Reinhardt, Carbon black, its properties and uses. *Jour. Ind. and Eng. Chem.*, vol. 12, 1920, pp. 324-342.

sulphur in coal undergoes in coking, and the distribution of the sulphur between coke and gas under varying furnace conditions was continued. A number of by-product coking plants were visited and much information collected on the relation of sulphur in coal to by-product coking in the steel industry.

In cooperation with W. W. Odell, of the Urbana station, problems related to the purification of sulphur in illuminating gas and coking plants were studied.

Mr. Powell read two papers at the September, 1919, meeting of the American Institute of Mining Engineers at Chicago, Ill., one entitled "The analysis of sulphur forms in coal" and one on "A study of the reactions of coal sulphur in the coking process." He also presented two papers at the spring meeting of the American Chemical Society, at St. Louis, entitled "The desulphurizing action of hydrogen on coke" and "The removal of sulphur from coke by hydrogen."

DESULPHURIZATION OF COKE.

An important commercial application of the study of sulphur in fuels is in the desulphurization of coke. Laboratory experiments have shown reduction of sulphur from 1.50 to 0.50 per cent by passing hydrogen or the lean distillation gases high in hydrogen over the heated coke. Large-scale oven experiments are now under way.

INVESTIGATION OF TRENT PROCESS FOR PURIFICATION OF COAL AND GRAPHITE.

An investigation of the Trent process for purifying coal is being made in cooperation with the Trent Process Corporation, of Washington, D. C., in order to determine the factors affecting the purification of pulverized coal by agitating it with water and oil. The action of different oils on different coals is being studied, and also methods of recovering the oils.

An application of the Trent process for purifying American graphites has been developed by J. D. Davis, chemist, and W. C. Ratliff, assistant chemist.

PERSONNEL.

J. D. Davis, chemist, is in charge of the coal and coal-products laboratory, assisted by W. C. Ratliff, assistant chemist, and Paul O. Rockwell, laboratory helper. A. R. Powell, physical organic chemist, conducted all research on sulphur in fuels. G. St. J. Perrott, physical chemist, assisted by S. P. Kinney, assistant chemist, and Harry Chernuchin, laboratory helper, conducted the research on coal purification. Dr. W. D. Harkins, consulting physical chemist, of the University of Chicago, was retained for consultation on the theory of coal purification by agitation with oil or flotation.

TUNNEL-GASES INVESTIGATIONS.

As mentioned on page 50, the Bureau of Mines, in cooperation with the New York and New Jersey State bridge and tunnel commissions, is conducting an investigation of the ventilation of vehicular tunnels. The vitiation of air by the exhaust gases of motor vehicles is being investigated at the Pittsburgh experiment station under the direction of A. C. Fieldner, supervising chemist. Various trucks and passenger cars, loaded and light, are tested under both summer and winter conditions over a selected test course, samples of the exhaust gases from these vehicles being analyzed. Tests of 50 cars and trucks showed an average of 5 to 6 per cent carbon monoxide in the exhaust gas, indicating a loss of some 25 per cent thermal efficiency. The physiological effect of automobile exhaust gases on human beings was investigated at Yale University, New Haven, Conn., under the supervision of Dr. Yandell Henderson, consulting physiologist. The maximum allowable percentage of carbon monoxide, the dangerous constituent of exhaust gas, for one hour proved to be 0.04 per cent, or four parts in 10,000 parts of air.

DETERMINATION OF SMALL PERCENTAGES OF CARBON MONOXIDE IN AIR IN PRESENCE OF GASOLINE VAPOR.

In connection with the investigation regarding the composition of automobile exhaust gases and their physiological effect it was found necessary to develop a method for determining small percentages of carbon monoxide in air in the presence of gasoline vapor. Ordinary methods of gas analysis did not give accurate results, and an iodine-pentoxide method was developed.

A paper entitled "Iodine-pentoxide method for determining carbon monoxide in low concentrations in air," has been prepared by M. C. Teague for publication.

PERSONNEL.

The investigation of automobile exhaust gases is in charge of A. C. Fieldner, supervising chemist.

The work on composition of automobile exhaust gases conducted at the Pittsburgh station was personally directed by Mr. Fieldner. He was assisted by A. A. Straub, mechanical engineer; A. N. Stratmoen, computer; Wm. Hillerich, auto mechanic; F. J. Wenzel, Wm. DeLancey, L. B. Berger, and W. B. Fulton, junior chemists; I. D. Ross and W. H. Miller, chemical laboratorians.

The work at Yale University on physiological effect of automobile exhaust gases was conducted by Dr. Yandell Henderson, physiologist in charge, aided by H. W. Haggard, physiologist; M. C. Teague,

gas chemist; C. Rowlands, chemist; A. L. Prince, psychologist; and Stanley Soby, mechanic.

CONSTITUTION OF GRAPHITIC ACID.

Dr. G. A. Hulett, consulting chemist, and O. A. Nelson, at Princeton University, studied the constitution of the graphitic oxides. The results of this work were reported in a paper entitled "Graphitic acid—colloidal oxide of carbon," read at the thirty-seventh general meeting of the American Electro-Chemical Society at Boston, April 8, 1920.

EXTRACTION OF COAL WITH SOLVENTS.

Several years ago J. C. W. Frazier and E. J. Hoffman, at the Pittsburgh station, extracted 50 pounds of Pittsburgh coal with pyradine and obtained a number of products which were expected to throw some light on the constitution of coal. Owing to the pressure of other work this investigation was suspended. In the latter part of the present fiscal year, arrangements were made for renewing this work at Johns Hopkins University, Baltimore, Md. J. C. W. Frazier, consulting chemist, assisted by H. K. Parker, junior chemist, are making a further examination of the extracted materials with a view to identifying some of the compounds.

PETROLEUM LABORATORY.

The work of the petroleum laboratory of the Pittsburgh station was under the direction of E. W. Dean, petroleum chemist. Other technical employees of the laboratory were: W. A. Jacobs, chemical engineer; L. E. Jackson, petroleum chemist; D. D. Stark, assistant petroleum chemist; D. C. Dunn, analyst; and A. D. Bauer, R. E. Mason, and W. B. Lerch, laboratory assistants. H. H. Hill, refinery engineer of the Bartlesville experiment station, spent several months at Pittsburgh, completing some work which was started while he was a regular member of the Pittsburgh staff, and completed under his direction in the Washington petroleum laboratory of the Bureau of Mines.

The Pittsburgh petroleum laboratory carried on routine testing and investigative work. The routine tests included crude petroleum, fuel oil, gasoline, lubricating oil, and other miscellaneous petroleum products. Fuel-oil testing was of particular importance, the bureau making inspections for a number of Government organizations. One item deserving particular mention was the analysis of approximately 400 samples of oil used by the United States Shipping Board. These samples represented purchases of approximately 4,000,000 barrels of oil, valued at over \$6,000,000. The Shipping Board inspection was carried on in connection with an investigation outlined for the pur-

pose of developing improved testing methods and specifications for fuel oil. The Pittsburgh petroleum laboratory cooperated with Mr. George M. Saybolt in developing a new viscosimeter adapted to the testing of fuel oil, and also obtained information that was used in selecting viscosity specification limits for several grades of fuel oil.

A number of other investigations were made for the purpose of developing improved apparatus and methods for the analysis of petroleum products. One of the most important achievements was a method for determining the water content of emulsified oils. This method was described in a paper by E. W. Dean and D. D. Stark,¹⁸ and has been favorably received by commercial laboratories.

A number of improvements have been made in methods of analyzing crude petroleum. A bulletin is in preparation entitled "The Analytical Distillation of Petroleum," by E. W. Dean, H. H. Hill, N. A. C. Smith, and W. A. Jacobs.

Samples of gasoline were collected and analyzed to complete a survey of the quality of motor fuel sold throughout the country. This work was done in cooperation with other petroleum laboratories of the bureau. Results are to appear in a bulletin by H. H. Hill and E. W. Dean.¹⁹ Part of the material included in this bulletin was used in a lecture by E. W. Dean, presented at a meeting of the Franklin Institute in December, 1920.²⁰

A manuscript of a bulletin entitled "The Production of Gasoline from Heavier Hydrocarbons by the Vapor-Phase Cracking Process," by E. W. Dean and W. A. Jacobs, was submitted for publication.

Work is in progress on a survey of the properties of typical crude petroleum produced in the United States.

E. W. Dean is a member of Committee D-2 of the American Society for Testing Materials, and has taken an active part in the work of this organization in the standardizing methods for testing petroleum products.

ADMINISTRATION OF THE PITTSBURGH EXPERIMENT STATION.

The administrative work of the Pittsburgh experiment station was in direct charge of E. A. Holbrook, superintendent. W. R. Talbot, as chief clerk, acted as general assistant. The administrative division may be divided into seven sections as follows: Technical service, clerical, purchases, supplies, files, library, mechanical, and care of buildings and grounds.

¹⁸ Dean, E. W., and Stark, D. D. A convenient method for the determination of water in petroleum and other organic emulsions: Jour. Ind. and Eng. Chem., vol. 12, 1920, p. 486.

¹⁹ Hill, H. H., and Dean, E. W. Quality of gasoline marketed in the United States: Bulletin 191, Bureau of Mines, 1920, 266 pp.

²⁰ Dean, A. W. Motor fuels: Jour. Franklin Inst., vol. 189, 1920, p. 269. Reprinted in Jour. Soc. Auto. Eng., vol. 6, 1920, p. 107.

In the technical service section are draftsmen, photographers, computers, and stenographers, who cooperate with investigators in the design and delineation of special apparatus, the reduction of observations, making of photographs and drawings. Copies of all pictures, drawings, computations, and reports are kept in file, ready for reference.

The clerical section includes stenographers, clerks, a telephone operator, and messengers.

The purchasing clerk, assisted by a proposal clerk, order clerk, and voucher clerk, purchases all equipment and supplies used by the station.

The supply room carries in stock commonly used materials, which are issued as needed. The supply-room clerk looks after the receiving and shipping of these materials.

The mails and files section is in charge of a junior clerk who has two assistants.

The station library contains over 6,000 technical publications and magazines. The accessions during the year consisted chiefly of bound periodicals and of Government publications.

The mechanical section, under the direction of a mechanical superintendent, has charge of the power plant, buildings, and grounds, instrument shop, carpenter and machine shops, the workmen who make installations and repairs, and laborers.

SALT LAKE CITY STATION.

The Bureau of Mines station at Salt Lake City, in cooperation with the metallurgical research department of the Utah School of Mines, continued throughout the year investigations of methods of treating profitably low-grade and complex ores of the State.

VOLATILIZATION OF LOW-GRADE AND COMPLEX ORES.

The application of the chloride volatilization process to the recovery of metals in low-grade and complex ores continued to be one of the major problems studied. The process, briefly stated, consists of crushing to the proper fineness; mixing with chloridizing agents, such as sodium and calcium chloride, alone or with other reagents; furnacing to effect chloridization and volatilization of the metal chlorides formed, and treatment of the volatilized chlorides to obtain the valuable metals in salable form. Electrical precipitation is the most feasible way of collecting the volatilized fume. The station's plant includes a rotary kiln of the cement type, a Wedge roasting furnace, and two electrical precipitators, each with a capacity of 1,500 cubic feet of gas per minute.

The treatment of the collected fume is one of the most important steps in the process. Experiment has shown that the fume from each ore is a problem in itself, but that in general the fumes fall into four classes: Lead-silver-gold fumes; copper-silver-gold fumes; lead-copper-silver fumes; and very complex fumes, such as lead-zinc-copper-mercury-silver-gold fumes.

Results thus far indicate that complex fumes as a rule require leaching with acid solution, with subsequent precipitation, and that lead-silver-gold or copper-silver-gold fume may often be directly smelted; no definite conclusion, however, as to a particular ore can be drawn without careful testing.

The volatilization process is best suited for low-grade oxidized ores of copper, lead, silver, and zinc, and also in large degree for the more complex oxidized ores of these metals. Treatment of complex sulphide ores by the method has not been generally successful, although experimental work indicates that such ore may be so treated after more is learned of the action of oxidized ores during volatilization.

During the year the station, in cooperation with various mining companies, tested a large number of types of low-grade and complex ores, by the volatilization method, and on several of them a practical treatment was worked out by the station, and later applied by the companies. The volatilization work was conducted by Messrs. Varley and Barrett, of the bureau, and by C. C. Steveson and F. R. Clark of the research department of the University of Utah.

COMPLEX SILVER-LEAD ORES FROM THE PARK CITY AND TINTIC DISTRICTS.

Among the ores treated were representative low-grade complex silver-lead ores from the Park City and typical silver-lead ores from the Tintic district of Utah.

Tests of semioxidized copper ore from the Pope Shenon Copper Co. at Salmon, Idaho, having indicated that volatilization was feasible, a 50-ton unit is being constructed by the company at its mines, to obtain the necessary data for designing a volatilization and electrical precipitation plant, and to obtain fume enough for experimental reduction.

Experimental work on ores from the Tintic Standard Co. mines gave good recoveries of the silver and of practically all the lead.

In cooperation with the Ontario Silver Mining Co., at Park City, Utah, several runs were made on low-grade complex ore carrying silver, lead, zinc, and some gold. Both oxidized ore from mine and dumps, and sulphide ore beneath the oxidized zone in the mine were tested. The tests showed that for both the oxidized and sulphide

ore practically all the lead could be volatilized and recovered, and about 87 per cent of the silver and gold.

In cooperation with the Yellow Pine Mining Co., experiments at the station were conducted on complex silver-lead-zinc ores from the Goodsprings, Nev., district, with encouraging results. Later a 50-ton volatilization unit was erected at the company's plant at Goodsprings. The company has been running a calcining rotary kiln, and experimental work with this kiln is being conducted by Messrs. Varley, Barrett, and Stevenson, of the station. The experimental work, which is still under way, indicates that the silver and lead can be removed and separated from the zinc. The Western Precipitation Co., of Los Angeles, Calif., installed an experimental electrical precipitator to recover the solids in the evolved gases.

SEPARATION OF LEAD AND ZINC.

In the treatment of complex ores, such as those mentioned above, the final treatment of the fume or leaching solution is often difficult, because of the zinc being so closely associated with the lead and silver. Methods of eliminating the zinc from the silver-lead product, or the lead from the silver and zinc, are being investigated by J. C. Morgan and Frank K. Clark.

REMOVAL OF IRON FROM ZINC LEACHING SOLUTION.

As iron is one of the most troublesome contaminants in zinc leaching solutions, a cheap method for eliminating it is desirable. Experiments indicate that oxidation by agitating the hot neutral solution with air is possible in the laboratory, and may be commercially feasible, but further work is necessary to determine this point. Tests are also being made of electrolytic oxidation of the iron, as well as of precipitation by various reagents. This work is being done by J. C. Morgan and T. A. Carlson.

LOW-GRADE COPPER-SILVER ORES.

Volatilization and leaching of low-grade silver-copper ore from the Silver Reef Mining Co., in southern Utah, gave good recoveries (about 86 per cent) of the silver and copper. A large part of the metal recovered was volatilized as fume, and the experimental reduction of this fume is under way.

POTASH.

Considerable work has been done on methods of utilizing the massive low-grade alunite deposits of Utah for manufacture of potash. Experiments have been conducted with the idea of economically

obtaining potash by a simple roasting and lixiviation of the ore. The objects of the test are to determine (1) the roasting temperature best adapted to a high recovery of potash by subsequent lixiviation; (2) the size of crushed ore which on roasting at the most desirable temperature gives the best extraction-crushing economy; (3) whether there is a loss of potash by volatilization during the roasting. The results of the tests have indicated that a high extraction of the potash is possible.

A leaching plant and other equipment for large-scale tests on potash ores was built at the station. Further tests are under way, with the object of recovering the alumina as well as the potash.

The experimental work is being conducted by W. Spencer Reid and J. C. Morgan.

ORE DRESSING.

Experiments on the concentration and flotation of molybdenum ore from Alta, Utah, were concluded. The molybdenum mineral was closely associated with iron, pyrite, and mica. The tests, which were conducted by Mr. Varley and metallurgists of the Stimpson Equipment Co., of Salt Lake City, gave good extractions of molybdenum and a high-grade product.

In cooperation with the Berkeley station, concentration and flotation tests of quicksilver ores from California were made. The tests, conducted by Mr. Varley and Harry Hanson, showed the possibility of recovering the mercury.

In cooperation with O. B. Hofstrand, metallurgical engineer, Salt Lake City, experiments on the flotation of a complex silver-lead-zinc-iron ore from Libby, Mont., were conducted by Mr. Hofstrand. The results were satisfactory as both regards products and recoveries.

OIL SHALES.

Throughout the year investigational work on oil shales has been carried on at the Salt Lake City station along two lines: (1) Study of methods of assaying oil shales for commercially recoverable oil and ammonium sulphate, and (2) experimental retorting of oil shales, together with a study of the products from different shales of the Rocky Mountain region. Both investigations are practically completed and have given valuable information as to the nature of the products to be obtained and as to the best methods of treating the shales.

M. J. Gavin, refining engineer, and L. C. Karrick, jr., refinery engineer, are conducting the work at the Salt Lake station.

The oil obtained in the retorting furnace will be utilized for making refinery tests to determine the commercial value of the refined products.

The station has accumulated a large amount of data pertaining to all phases of the oil-shale industry, both for the use of the bureau's investigators and for equipping the bureau to answer requests for information on the subject.

MICROSCOPIC WORK.

The microscopic laboratory examined, in addition to ores tested by the Salt Lake station, various ores and minerals submitted by the California State Mining Bureau, by other stations of the Bureau of Mines, and by mining men, as well as photographic work in connection with the smoke investigation. The work is conducted by R. E. Head.

SMOKE INVESTIGATION.

In the cooperative investigation with the State of Utah and the city of Salt Lake on methods of abating smoke in Salt Lake City, the Bureau of Mines' station was used as headquarters for the staff of investigators, and contributed aid in the collection of samples and in analytical work.

SEATTLE STATION.

The Seattle station investigated the mining and utilization of western coals, the chemistry of flotation, electrometallurgical treatment of low-grade ores, ceramic value of the clays of Idaho and Washington, ore dressing, and the treatment of the low-grade ores of the Northwest.

COAL MINING.

The coal-mining investigations are described under the work of the mining division.

COAL WASHING.

Study of the coal-washing problems in the State of Washington, which is being conducted in cooperation with the State University, was continued throughout the year under the direction of E. R. McMillan, assistant mining engineer.

Fresh mine samples and washery products from a number of mines were tested by screening and the float-and-sink method to determine the quality of the coals, the efficiency of the present coal-washing equipment, and the maximum improvement of the coal by the most efficient washing method. The tests were made by a standardized method developed by the bureau in order to insure comparable results.

Samples from mines and washing plants at Renton, Bayne, Durham, Bellingham, Mendota, and Pocahontas were tested during the

year. The results of the tests showed: (1) The coals of each mine may be greatly improved by efficient washing; (2) none of the present washeries are operating efficiently—those producing fairly clean-washed coal are losing 20 to 30 per cent of the washery feed as good coal in the washery refuse and overflow water, and those reducing the washery losses to a minimum are shipping 40 to 60 per cent of the avoidable impurities in the unwashed coal; (3) 60 to 100 per cent of the mine output was washed.

Tests with a laboratory size of commercial coal-washing table showed that the buckwheat and slack coal from a number of mines could be washed more efficiently in this way than by jigging. One result of these tests has been the erecting of a separate table coal-washing plant at one of the mines to recover 150,000 tons of clean coal from an old sludge dump.

In connection with the float-and-sink tests, a special study of the relation between the ash content and the specific gravity of the coal showed that the relation was fairly definite as determined by the float-and-sink tests on solutions of different densities of the coal from each mine or separate bed. This relation appears to hold good for any size of raw coal, washed coal, bone, or washery refuse. A paper is in preparation on the subject. Also papers are in preparation on "Specific gravity studies of Washington coals and their associated impurities," and on "Standardization and value of float-and-sink tests in commercial coal washing."

A number of washing tests of samples of coal from the Bering River field, Alaska, indicated that the ash content could be reduced to approximately 2 per cent, with a recovery of more than 80 per cent of the coal.

POWDERED COAL.

B. J. Cross, junior chemist, visited a number of large plants for burning pulverized coal and examined several stoking equipments for small house-heating plants. Subsequently Mr. Cross was transferred to the Pittsburgh station, where coal-dust firing studies are under way.

In connection with the study of storage and distribution of powdered coal, and with special reference to spontaneous ignition of stored coal and to the possible relation of moisture content as a factor, visits were made to briquetting and pulverizing plants and storage and distributing plants for handling powdered coal in different cities of the State of Washington.

FLOTATION OF ORES.

W. H. Coghill, metallurgist, and C. O. Anderson, assistant metallurgist, are making a special study of the physical and chemical principles of flotation. Papers were prepared on the equilibrium of three-

phase systems of two liquids and a gas, three-phase systems of a solid, a liquid, and a gas, with a chapter on the angle of contact and the edge effect.

On molybdenite-chalcopyrite ore from Shakan, Alaska, a satisfactory separation was effected, giving a rich molybdenum concentrate and a copper concentrate. In the analytical work difficulty was experienced in determining copper in the presence of molybdenum by the standard iodide method, but a satisfactory method was devised.

Encouraging results were obtained on molybdenite-chalcopyrite ore from Republic, Wash.

Subsequently Messrs. Coghill and Anderson were transferred to the Golden station, and work on ore flotation at Seattle was discontinued.

COOPERATION WITH THE UNIVERSITY OF IDAHO.

The work at the University of Idaho is in charge of C. A. Wright. A statement regarding the nature of the cooperative work at Moscow is given on page 117.

ELECTROMETALLURGY.

C. D. Grier, assistant metallurgist, wrote a paper, "Electrometallurgical and electrochemical industry in the State of Washington," which was published by the University of Washington.

O. C. Ralston, superintendent, who took charge of the station on March 1, 1920, is making an intensive study of power and raw materials for electrochemical and electrometallurgical industries in the Northwest. Installation of station equipment, delayed for several years by the war, was completed, and the long-deferred electrometallurgical work will now proceed.

CERAMICS.

The Seattle station is cooperating with the ceramic department of the University of Washington and the State geological survey in an investigation of the clays of the State.

Hewitt Wilson, professor, ceramics department; Fred Heath, laboratory assistant; and S. L. Glover, geologist of the State geological survey, inspected clay properties and plants in eastern Washington and collected 100-pound samples for testing.

Preliminary tests of physical and pyrochemical properties were conducted under Prof. Wilson. Similar tests were made on clays from Idaho in cooperation with the Idaho State Bureau of Mines and Geology.

Clays of western Washington will receive similar study during the summer of 1920.

TUCSON STATION.

TREATMENT OF PORPHYRY COPPER ORES.

The SO_2 leaching plant at the Tucson station was moved into a new brick building and was remodeled and improved. It may now be used for testing nonsulphide or a mixture of sulphide and non-sulphide copper ores in quantities ranging from 500 pounds to a car-load. During the year the 100-ton SO_2 leaching plant built by the Miami Copper Co. in cooperation with the Tucson station was brought to a high point of mechanical efficiency, the leaching results attained confirming the original small-scale tests at Tucson. At present the Miami Copper Co. is investigating the application to the Miami ores of sulphuric-acid leaching followed by electrolytic precipitation. As the results obtained by the improved methods seem to warrant a large-scale test in competition with SO_2 leaching, a decision as to the comparative value of sulphuric acid and sulphurous acid for leaching the Miami ores, which contain an unusually large proportion of copper silicate, will be delayed at least a year.

An SO_2 leaching plant having a minimum capacity of 25 tons has just been completed by the Arizona Copper Co. at Clifton, Ariz. It was built under the direction of the Tucson station to parallel the company's sulphuric acid leaching test plant, which has been in operation for a year or more. It is proposed to make an exhaustive comparative test of the different complex ores of the district, the duration of the tests to be three to six months. The preliminary results of the first month's operation are quite favorable to SO_2 leaching.

The cooperative staff of the leaching investigations included C. E. Van Barneveld, supervising mining engineer and metallurgist; E. S. Leaver, metallurgist; C. E. Postma, assistant chemist; and L. Eckman, junior chemist of the Tucson station; and Messrs. H. W. Morse, H. D. Hunt, and R. V. Thurston, of the Miami research staff.

SPONGE IRON.

Investigations on the deoxidizing of pyrite calcines to furnish sponge iron for precipitating copper from leaching solutions were continued. Experiments are being conducted on the method of using gasified oil as a deoxidizer. The work is being done by E. S. Leaver and G. E. Postma, assisted by Dr. E. Eastman, of the University of California.

URBANA STATION.

The Urbana station, in cooperation with the mining department, University of Illinois, and the Illinois State Geological Survey, conducted investigations during the fiscal year on a number of problems, as follows:

COAL-WASHING PRACTICE IN THE MIDDLE WEST.

Throughout the year the investigation of coal-washing practice in the Middle Western States, was continued with the purpose of minimizing coal losses and lowering the sulphur and ash content of the coal product in order to render it more suitable for coking and other purposes.

A series of tests of raw coal and washery products collected from the plant of the No. 7 mine of the Big Muddy Coal & Iron Co., at Herrin, Ill., were completed. The tests showed that "sludge" or small coal mixed with water, which had been a waste product, could be treated with profit and much of the small coal recovered.

Washing and coking tests of coal from the Clover Run mines of the Maderia Hill Coal Co., at Mahaffey, Pa., were completed. The tests showed that the ash content and sulphur content could be substantially reduced by fine crushing and proper washing, and the washed coal successfully used for by-product coking.

A high-sulphur bituminous coal from a West Virginia mine was tested in an effort to lower the sulphur content. Producer gas made from this coal on account of the high-sulphur content, had given trouble in steel plants. The tests showed that most of the sulphur was in the so-called organic form, and could not be removed by washing.

A study is being made of the accuracy of float-and-sink tests on various types of coals, and of the relation between the specific gravity and the ash and sulphur content of eastern coals. In connection with these tests an improved float-and-sink apparatus was constructed, as well as equipment for separating into 4-inch intervals, along the discharge end and side, the coal and refuse coming from the washing table thus giving a number of products from cleanest coal to cleanest refuse, which can be compared by analyses.

A series of classification tests of finely ground coal are being conducted in an attempt to separate shale, pyrite, and coal.

A paper on "Factors that affect the washability of a coal"²⁴ and another on "Coal washing with concentrating tables"²⁵ were published.

OCCURRENCE AND DISTRIBUTION OF SULPHUR IN COAL.

A study of the occurrence and distribution of organic sulphur in the coal seams of an Illinois mine has been completed. The results show the variations of the forms and may have a bearing on the origin of fine pyrite and on washability. Tests of samples from a mine in Kentucky are contemplated.

²⁴ Jour. Amer. Inst. Mining Eng., September, 1919, pp. 1817-1827; Coal-Industry, October, 1919; Coal Age, Oct. 30, 1919.

²⁵ Coal Industry, January, 1920.

In all the raw and washed coal examined the form of the sulphur have been determined; the results indicate that organic and finely disseminated pyritic sulphur affect washability, but no definite relation between the two forms and the washability of a given coal have been established.

The work on coal washing and testing was conducted by Thomas Frazer, assistant mining engineer, and H. F. Yancey, assistant chemist.

WATER-GAS MANUFACTURE.

W. W. Odell, gas engineer of the bureau, in cooperation with W. A. Dunkley, of the Illinois Geological Survey, continued an investigation of practice at water-gas plants in the Central West, with the purpose of expanding the use of Middle-West coal as water-gas generator fuel. As a result of the study of plants in Chicago, plans were prepared and submitted to the Chicago gas companies whereby, under some operating conditions, marked improvements in operating efficiencies can be obtained by using central district coals as a generator fuel. Mr. Odell also cooperated with the Public Service Co., of northern Illinois, in designing a more economical water-gas set suitable for coal fuel.

Plans are being prepared for a proposed special type of water-gas set to increase efficiency of operation and overcome some of the difficulties encountered in using bituminous coal from the central district.

A bulletin on the distillation products of coal tar obtained at gas plants has been prepared.

SUBSIDENCE FROM UNDERGROUND MINING.

In the study of surface subsidence at mines, begun several years ago; surface and underground monuments have been established at selected mines in the Illinois fields, and careful surveys and measurements are made from time to time in order to determine the rate and the amount of subsidence that may be expected from removing a given quantity of coal from the ground.

The observations were made, in cooperation with Prof. C. M. Young, of the University of Illinois, at first by Thomas Frazer, assistant mining engineer, of the Urbana station, and later by C. A. Herbert, district mining engineer of the bureau at Vincennes, Ind.

ITHACA OFFICE.

The Ithaca field office was busy on two main problems during the year: (1) The cooperative work with the Navy Department on the preparation of special alloy steels, and (2) collection of data on electric brass furnaces. In addition, some preliminary work was done on several minor problems.

PREPARATION OF ALLOY STEELS.

The office continued throughout the year its cooperative work with the Navy on the manufacture in the electric furnace and the analysis of light-armor steels. About 175 steels, in which zirconium, titanium, aluminum, nickel, copper, chromium, cerium, molybdenum, vanadium, and uranium were used as alloying elements in high silicon steel, were made and shipped to the Bureau of Standards for rolling, heat treatment, and testing. After this series was completed the Navy requested that a further series of the more promising steels be prepared. Accordingly a series of 70-pound heats of about 30 steels was made. These will be shipped to the Halcomb Steel Co. for rolling and heat treatment, and will then be tested by the Navy. The bureau's part of this work is finished save for some analytical work and for taking data on rolling and heat treatment.

ELECTRIC BRASS FURNACES.

The other main problem of the Ithaca office has been the collection of up-to-date data on the operation of electric brass furnaces to supplement previous experimental work on this subject. A report dealing with all brass furnaces, both experimental and commercial, has been prepared for publication.

PERSONNEL.

The work at Ithaca has been directed by Dr. H. W. Gillett, chief alloy chemist. He was assisted by Dr. E. L. Mack, assistant alloy chemist. W. B. Smith and Lieut. J. O. Jenkins, the latter being replaced part of the time by Lieut. R. McLane, of the Navy Department, assisted in the work on alloys. Also, J. G. Thomson, of the bureau, was temporarily employed for short periods on this work.

MOSCOW OFFICE.

The work of the year related chiefly to the use of flotation for concentrating lead-silver and other ores from mines in Idaho.

DALLAS OFFICE.

The increasing amount of work done by the bureau in the oil fields of Texas has necessitated the establishing of a field office at Dallas. Oil field production problems in the north Texas fields have been under the direction of A. A. Hammer (resigned), R. E. Collom (transferred), and W. A. Snyder, in charge at the Dallas office, which is used as headquarters for the men engaged in this work. The office quarters in the insurance building were obtained through the courtesy of the Dallas Chamber of Commerce.

REPORT ON WALTERS GAS FIELD.

The city of Dallas asked the bureau for technical advice on the condition of the Walters gas field, Oklahoma. A report prepared by T. E. Swigart, of the Bartlesville station, containing recommenda-

tions on methods of drilling for and conserving the gas supply of the Walters field, was submitted to the mayor of Dallas and to the Lone Star Gas Co.

W. A. Snyder and J. B. Kerr are studying drilling and development problems in the Burkburnett field, Texas. The field has a number of pools, and special attention is being given to the possibility of shallow oil zones having been passed in drilling.

INVESTIGATION IN MONROE GAS FIELD.

R. E. Collom assisted operators and refiners in the Monroe gas field, Louisiana, and attended conferences held by the Louisiana State conservation commission in connection with efforts to conserve gas in the Monroe field.

STUDY OF WATER CONDITIONS IN THE RANGER FIELD.

Mr. Collom also made a study of conditions in the Satterfield area, Ranger field, Texas, and prepared advisory recommendations on water troubles there.

A number of companies have begun repair work on their wells, based on recommendations contained in the report. Mr. Snyder, expert driller, is assisting in supervision of the repair work.

DRILLING PROBLEMS IN KEMP-MUNGER-ALLEN FIELD, TEXAS.

In the Kemp-Munger-Allen field, one of the recent oil discoveries, near Wichita, Tex., operators have had considerable trouble in determining the exact depth to and the relations of the water and oil sands. Mr. Snyder has assisted companies in this field in drilling problems.

OPERATING CONDITIONS IN OIL LANDS ON TEXAS-OKLAHOMA BOUNDARY.

At the request of Frederick A. Delano, receiver appointed by the United States Supreme Court for litigated oil lands on the Texas-Oklahoma boundary, Messrs. Collom and Kerr prepared a report on the lands. This report classifies the proved oil areas, gives recommendations for methods of pumping, and data on production and transportation.

SAN FRANCISCO OFFICE.

The office in San Francisco, Calif., which serves as headquarters for engineers of the petroleum division detailed to the western fields, is in charge of C. P. Bowie, petroleum engineer. Results of most of the field and laboratory investigations conducted through this office have already been mentioned under the work of the petroleum divi-

sion. Mr. Bowie, in addition to other work, completed his paper on "Oil-camp sanitation."

The following engineers were detailed part time to this office on the investigations named: E. W. Waggy, perforating casing and setting screen pipe; Thomas Curtin (resigned), pipe-fishing methods; M. J. Gavin, utilization of oil shales; C. H. Beal, factors in oil production; R. E. Collom, royalties, bonuses, and leasing problems; and prospecting and testing of oil, gas, and water bearing strata; J. H. Wiggins, evaporation of petroleum in storage; A. W. Ambrose, underground conditions in oil fields; T. E. Swigart, pumps used in the protection of oil, and methods of protecting the upper oil strata.

Other work conducted at this office is described below:

MODES OF OCCURRENCE OF OIL, GAS, AND WATER.

R. V. Mills, petroleum technologist, has continued his studies of the occurrence and relationships between gas, oil, and water in different fields and their movements and rearrangements in the pay sands consequent to oil and gas extraction. The modes and causes of injury to pay sands and consequent losses of oil through infiltrating waters have been studied in the field as well as through laboratory experiments. Results of a part of this work have been prepared for publication.

OIL-WELL DRILLING.

In some fields in California and elsewhere much trouble has been experienced in shutting off water from the wells because of the corrosion of well casing and the improper setting of cement. An investigation aimed to enable operators to cement off water and protect well casings against corrosion by using certain chemicals, either with or without Portland cement, has been continued under Mr. Mills.

EVAPORATION LOSSES OF OIL IN CALIFORNIA.

Experimental work on evaporation of oil while in tank storage is being conducted by A. R. Elliott, assistant petroleum engineer, under the direction of C. P. Bowie. The observations are being made on specially erected tanks on the property of the Shell Co. near Coalinga, Calif. Temperature-recording instruments and other modern apparatus are used both in the field and in the laboratory. Experiments are being made also with various colors for painting tanks and various types of shelters for tanks. In cooperation with various oil companies, Mr. Elliott is collecting data covering all losses in the transportation of oil from the well to the storage farm.

CRACKING TARS AND HEAVY OILS.

C. P. Bowie and M. J. Gavin, refinery engineer, continued a study of the utilization of heavy crude oils. In connection with this work they designed and built a small cracking furnace heated electrically. In a number of trial runs on different crudes good results were obtained. Furnace construction at various plants is being studied to determine the feasibility of constructing an oil or gas fired cracking furnace of commercial size.

USE OF OIL BURNERS IN BRICK MANUFACTURE.

A study in the use of oil burners in brick manufacture was made by Mr. Elliott, who visited brick plants near San Francisco. A report on the subject was prepared and copies sent to brick companies interested.

PROSPECTING AND TESTING OIL, GAS, AND WATER BEARING STRATA.

Results of an investigation on prospecting and testing oil, gas, and water bearing strata will be published in a bulletin by R. E. Collom, which will treat particularly (1) the classification of oil, rocks, and minerals and the signs of oil and gas; (2) methods of drilling as regards identification of strata and testing for fluid content; (3) testing various strata for productivity; and (4) specific application of the principles to development in several oil and gas fields.

LABORATORY.

The laboratory at the San Francisco office is in charge of E. C. Lane, assisted by L. A. Penn. During the year a large number of oil samples have been distilled to obtain data for the bulletins on evaporation prepared by Messrs. Wiggins and Elliott; two furnaces, designed for cracking tars and heavy oils, have been constructed and used.

PETROLEUM BIBLIOGRAPHY.

The work of compiling the bibliography of petroleum and allied substances is done at the San Francisco office by Miss E. H. Burroughs, editorial assistant.

DRAFTING SECTION.

The drafting section, in charge of J. G. Shumate, prepared about 300 maps and other drawings to illustrate reports written by members of the petroleum division and prepared also designs and drawings for three types of oil-cracking furnaces and a dephlegmator for use in experimental work.

WORK OF OPERATIONS BRANCH.

The work described below was under the general supervision of F. J. Bailey, assistant to the director.

ADMINISTRATION.

MAILS AND FILES.

There was a considerable increase in the quantity of mail received and dispatched by the bureau over that of the previous fiscal year. This increase was due partly to the natural growth and expansion of the bureau, and also partly to the more frequent making and sending out of reports of investigations containing timely items of value and general interest to the mining and mineral industries.

FINANCIAL STATEMENT.

The total amount appropriated by Congress for the work of the Bureau of Mines for the fiscal year ended June 30, 1920, was \$10,916,897; the disbursements were \$4,560,913.05.

Below is a statement showing the appropriations made and the sum distributed under each appropriation:

Amounts appropriated for and expended by the bureau for the fiscal year ended June 30, 1920.

Title.	Amounts.	Repayments.	Available.	Disbursements.	Balance available subject to vouchers or claims.
General expenses.....	\$73,300.00		\$73,300.00	\$72,894.08	\$405.92
Mine accidents.....	422,210.00	\$6,116.47	428,326.47	428,001.16	325.31
Testing fuel.....	150,000.00	4,025.81	154,025.81	153,763.06	262.75
Mineral mining investigations.....	100,000.00		100,000.00	99,640.89	359.11
Petroleum and natural gas...	125,000.00	205.19	125,205.19	124,939.36	265.83
Explosives.....	15,000.00		15,000.00	14,161.13	838.87
Expenses, mining experiment stations.....	150,000.00		150,000.00	149,796.27	203.73
Care, etc., new buildings and grounds, Pittsburgh, Pa...	17,220.00		17,220.00	17,075.83	144.17
Operating mine-rescue cars.....	154,667.00		154,667.00	153,486.13	1,180.87
Inspecting mines in Alaska.....	7,000.00		7,000.00	5,801.10	1,198.90
Books and publications.....	1,500.00		1,500.00	1,500.00	
Land for mine-rescue cars.....	1,000.00		1,000.00	307.06	692.94
Maintenance and operation fuel yards.....	11,100,000.00	1,653,467.90	2,753,467.90	1,924,750.57	* 828,708.33
Adjustment and payment of mineral claims.....	* 8,500,000.00		8,500,000.00	1,401,302.56	* 7,098,697.44
Investigation of lignite coals and peat.....	* 100,000.00		100,000.00	13,484.85	* 86,515.15
Total.....	10,916,897.00	1,663,815.37	12,580,712.37	4,560,913.05	8,019,799.32

¹ Balance available from 1919.

² Available for 1921.

³ Available Mar. 2, 1919.

⁴ Available until expended.

⁵ Available Feb. 25, 1919.

PERSONNEL.

On June 30, 1920, there were 738 employees on duty in the Bureau of Mines, 634 of whom held Secretary's appointments, distributed and classified as indicated in the following table:

Number of appointees on duty in the Bureau of Mines June 30, 1920.

Location.	Classification and number of appointees.			
	Technical.	Clerical.	Non-clerical.	Total.
Washington.....	1 42	125	1 68	235
Pittsburgh.....	1 78	40	1 111	227
Field in general.....	1 80	34	1 58	172
Total.....	198	199	237	634

1 Engineers, 19; chemists, 9; miscellaneous, 14.

2 Includes such employees as chauffeur, mechanic, watchman, messenger, laborer.

3 Engineers, 24; chemists, 26; miscellaneous, 26.

4 Includes such employees as fireman, watchman, oiler, carpenter, shot-firer, janitor, machinist's helper, laborer, and mechanics.

5 Engineers, 37; chemists, 17; miscellaneous, 26.

In addition to the employees enumerated in the table there were 104 unskilled laborers and other miscellaneous employees, including cooks, employed on field agreement, 20 of whom were in Pittsburgh and 84 in the field in general, or a total of 738 employees on duty June 30, 1920—a decrease of 44 appointees and an increase of 38 on field agreements, as compared with the preceding fiscal year.

The total number of changes in status requiring the approval of the Secretary of the Interior, and consisting of appointments, reinstatements, transfers, promotions, reductions, separations, extensions of limited appointments, etc., was 2,048. The number of changes in status on field agreements issued by the director with the approval of the Secretary of the Interior, and including employments, separations, promotions, extensions, and reductions, was 1,103, a total of 3,151 in all, an increase of 336 over the preceding fiscal year. In connection with the various status changes listed, a total of 2,738 miscellaneous letters and other general correspondence incident to personnel work were necessary.

Statement of leave granted to employees of the Bureau of Mines during the calendar year 1919.

	Washing- ton.	Field.	Total.
Number of employees granted leave of absence.....	287	377	664
Number of employees granted annual leave.....	266	365	631
Amount of annual leave granted.....days.....	4, 929	6, 352	11, 311
Average taken per employee.....do.....	18.5	17	17.7
Amount of annual leave permissible.....do.....	5, 954	9, 053	15, 007
Percentage of annual leave taken.....do.....	82.7	70.4	75.3
Number of employees granted sick leave.....	173	119	292
Amount of sick leave granted.....days.....	1, 429	963	2, 392
Average taken per employee.....do.....	8	8	8
Amount of sick leave permissible.....do.....	5, 954	9, 053	15, 007
Percentage of sick leave taken.....do.....	24	10.6	15.9
Number of employees granted leave without pay.....	61	31	92
Amount of leave without pay granted.....days.....	921	1, 384	2, 305
Number of employees reported tardy.....	20		20
Amount consumed in tardiness.....days.....	5.5		5.5

EDUCATIONAL AND INFORMATIONAL WORK.

T. T. Read, engineer in charge of the Division of Education and Information, among other duties paid special attention to the work of establishing contact with the Government departments and the public, reviewed reports submitted for publication, and made recommendations as to the best methods of presentation and publication.

ECONOMIC LIAISON WORK.

During the past year the Bureau of Mines was represented on the economic liaison committee by H. C. Morris until May 31, 1920, and afterwards by T. T. Read.

The bureau has found the intimate contact with other departments, established through the committee, to be of great assistance in disseminating information regarding various critical phases of the petroleum industry and in obtaining similar information from other departments. The bureau regards the coordination and teamwork displayed by the governmental agencies interested in petroleum and represented on the committee as indicative of the value of the conferences.

A continuance of the work of the committee and a broader field for the dissemination of its reports and findings are expected.

The work of the subcommittee of strategic materials, in so far as it touches mineral commodities, has been actively assisted and encouraged by the bureau as presenting the best available means of furnishing all agencies of the Government with a condensed and complete outline on which to base more detailed studies of those commodities.

STATISTICS OF ACCIDENTS AND FATALITIES IN THE MINERAL INDUSTRIES.

With the purpose of providing reliable information as to the hazards of workmen in the mineral industries and the work to be done in lessening the death and injury rate from accidents, the Bureau of Mines compiles and publishes reports on mine accidents. Information as to fatalities in coal mines is collected through the cooperation of State mine inspectors.

Data on accidents in metal mines, quarries, coke ovens, and metallurgical plants, except blast-furnace plants, are furnished voluntarily by operators, there being no Federal law requiring the operators to report. Although these figures are not absolutely complete, they are on a comparable basis for calendar years and furnish means for an intelligent comparison of statistics of accidents in the different States.

The reports on coal-mine fatalities are issued monthly; those on metal-mine, quarry, and coke-oven accidents and on accidents at

metallurgical plants are issued annually. The collection and compilation of these statistics was in charge of A. H. Fay, mining engineer, until his resignation, on February 25, 1920, and later in charge of W. W. Adams, mine-accident statistician.

EXAMINATION OF MINING LAWS.

In order to promote uniformity in the mining laws of the several States, the Bureau of Mines is collecting and publishing the State laws and the court decisions showing how the laws have been interpreted. This work is essential in showing the growth of the mining laws and the provisions the courts have held to be valid and invalid and constitutional and unconstitutional. The bulletin for the Pennsylvania statutes is practically ready for distribution, and the bulletin for the Colorado statutes is in press.

The law examiner, J. W. Thompson, who is in charge of this work at the Washington office, compiled a summary of the laws of all the countries of North and South America that bear upon the petroleum industry. This will be published in the near future.

REPORTS OF INVESTIGATIONS.

During the year various brief reports on topics of timely interest were published by the bureau in mimeographed form and distributed to the technical press and to Government organizations, to companies, or individuals interested. These reports present results of minor investigations or special phases of major investigations. They have proved a valuable adjunct to the printed publications of the bureau in disseminating information and in keeping the public informed of the bureau's activities. They deal with major metals, minor and rare metals, nonmetallic minerals, petroleum, natural gas, gasoline, coal, coke, lignite, safety work, mine accidents, and other subjects.

Among the more important papers on major metals were the series prepared by F. T. Eddingfield and F. E. Wormser on conditions in the iron and copper mining industries, with special reference to production, reserves, and movements of iron and copper in the domestic and foreign markets. They also prepared a similar series on the gold and silver situation in the United States and foreign countries, and movements of the ores and metals in the United States and to and from the United States and foreign countries.

The assembling and editing of these reports was in charge of an engineer, who also assisted the chief of division in matters of office administration. This work was at first performed by R. B. Ladoo, mineral technologist, and later by H. E. Tufft, mining engineer.

PUBLICATIONS.

The Bureau of Mines publishes bulletins, technical papers, miners' circulars, a monthly statement of fatalities in coal mines, the annual report of the director, and miscellaneous publications, such as handbooks on special subjects, posters, charts, lists, and schedules.

The bulletins include those reports that present in detail the results of technical and scientific investigations; they are of interest chiefly to engineers, chemists, mine officials, and other persons familiar with the subjects discussed. The technical papers are shorter and less formal than the bulletins, and contain preliminary notices of the results of the progress of detailed investigations, or describe small incidental investigations. The miners' circulars deal with such practical matters as accident prevention, rescue and first-aid methods, the safeguarding of health, and other topics that directly concern the workers in mines, mills, and metallurgical plants. The circulars are written in simple, nontechnical English, and are printed in much larger editions than are the bulletins and technical papers. One of the circulars, that on first aid for miners, is printed in Italian, Polish, and Slovak, with the English translation on opposite pages.

The bulletins and technical papers issued during the fiscal year ended June 30, 1920, are listed in the following statement:

BULLETINS.

- Bulletin 78. Approved explosion-proof coal-cutting equipment, by L. C. Ilsley and E. J. Glehn. 1920. 53 pp., 18 pls., 3 figs.
- Bulletin 95. A glossary of the mining and mineral industry, by A. H. Fay. 1920. 754 pp.
- Bulletin 112. Mining and preparing domestic graphite for crucible use, by G. D. Dub and F. G. Moses, with a chapter on methods of analysis used by the Bureau of Mines, by C. B. Taylor and W. A. Selvig. 1920. 80 pp., 5 pls., 20 figs.
- Bulletin 162. Removal of lighter hydrocarbons from petroleum by continuous distillation, by J. M. Wadsworth. 1919. 162 pp., 50 pls., 45 figs.
- Bulletin 173. Manganese, uses, preparation, mining costs, and the production of ferro-alloys, by C. M. Weld and others. 1920. 209 pp., 13 figs.
- Bulletin 175. Experiment stations of the Bureau of Mines, by Van. H. Manning. 1919. 106 pp., 29 pls., 2 figs.
- Bulletin 178 B. War minerals, nitrogen fixation, and sodium cyanide. Advance chapter from Bulletin 178, War work of the Bureau of Mines, by Van. H. Manning. 1919. 41-61 pp.
- 178 C. Petroleum investigations and production of helium. Advance chapter from Bulletin 178, War work of the Bureau of Mines, by Van H. Manning. 1919. 63-87 pp.
- 178 D. Explosives and miscellaneous investigations. Advance chapter from Bulletin 178, War work of the Bureau of Mines, by Van. H. Manning. 1919. 89-107 pp.
- Bulletin 181. Abstracts of current decisions on mines and mining, reported from January to May, 1919, by J. W. Thompson. 1919. 175 pp.

Bulletin 183. Abstracts of current decisions on mines and mining, reported from May to September, 1919, by J. W. Thompson. 1920. 167 pp.

Bulletin 196. Coal-mine fatalities in the United States, 1919, and coal-mine statistics supplementing those published in Bulletin 115, with list of permissible explosives, lamps, and motors tested prior to Jan. 31, 1920, by A. H. Fay. 1920. 86 pp.

TECHNICAL PAPERS.

Technical Paper 210. An analytical method for detecting blown-out shots in coal mines, by G. F. Hutchison and Jacob Barab. 1919. 22 pp.

Technical Paper 211. Approximate quantitative microscopy of pulverized ores, including the use of the camera lucida, by W. H. Coghill and J. P. Bonardi. 1919. 20 pp., 3 pls.

Technical Paper 225. The vapor pressure of lead chloride, by E. D. Eastman and L. H. Duschak. 1919. 16 pp., 2 pls., 2 figs.

Technical Paper 226. Men who received Bureau of Mines certificates of mine-rescue training, July 1, 1916, to June 30, 1918, compiled by D. J. Parker. 1919. 72 pp.

Technical Paper 227. The determination of mercury, by C. M. Bouton and L. H. Duschak. 1920. 44 pp., 2 pls., 1 fig.

Technical Paper 229. Accident prevention in the mines of Butte, Montana, by Daniel Harrington. 1920. 59 pp., 2 pls.

Technical Paper 231. Production of explosives in the United States during the calendar year 1918, with notes on coal-mine accidents due to explosives and list of permissible explosives tested prior to March 31, 1919, by A. H. Fay. 1919. 21 pp.

Technical Paper 232. Absorption as applied to recovery of gasoline left in residual gas from compression plants, by W. P. Dykema and R. O. Neal. 1920. 43 pp., 6 pls., 10 figs.

Technical Paper 234. Sensitiveness of explosives to frictional impact, by S. P. Howell. 1919. 17 pp., 2 pls., 1 fig.

Technical Paper 235. Safe storage of coal, by H. H. Stoek. 1920. 10 pp.

Technical Paper 236. Abatement of corrosion in central heating systems, by F. N. Speller. 1919. 12 pp., 2 figs.

Technical Paper 237. Safe practice in using wire ropes in mines, by R. H. Kudlich and O. P. Hood. 1919. 11 pp.

Technical Paper 238. Indicators for carbon dioxide and oxygen in air and flue gas, by L. H. Milligan, D. O. Crites, and W. S. Willson. 1920. 23 pp., 3 pls., 12 figs.

Technical Paper 239. Coke-oven accidents in the United States during the calendar year 1918, compiled by A. H. Fay. 1919. 26 pp.

Technical Paper 240. Boiler and furnace testing, prepared by Rufus T. Strohm. Reprint of Engineering Bulletin 1, United States Fuel Administration. 1920. 23 pp., 3 figs.

Technical Paper 241. Blowholes, porosity, and unsoundness in aluminum-alloy castings, by Robert J. Anderson. 1919. 34 pp.

Technical Paper 242. Why and how coke should be used for domestic heating, by Henry Kreisinger and A. C. Fieldner. 1919. 20 pp., 1 fig.

Technical Paper 243. Development of liquid oxygen explosives during the war, by G. S. Rice. 1920. 46 pp., 2 pls., 6 figs.

Technical Paper 244. Use of stench as a warning in mines, by S. H. Katz, V. C. Allison, and W. L. Egy. 1920. 31 pp., 1 pl., 4 figs.

Technical Paper 245. Quarry accidents in the United States during the calendar year 1918, by A. H. Fay. 1920. 52 pp.

- Technical Paper 247. Perforated casing and screen pipe in oil wells, by E. W. Wagy. 1920. 48 pp., 6 pls., 12 figs.
- Technical Paper 250. Metal-mine accounting by C. B. Holmes. 1920. 63 pp.
- Technical Paper 252. Metal-mine accidents in the United States during the calendar year 1918, compiled by A. H. Fay. 1920. 113 pp.
- Technical Paper 253. Effects of gasoline removal on the heating value of natural gas, by D. B. Dow. 1920. 23 pp., 2 figs.
- Technical Paper 256. Accidents at metallurgical works in the United States during the calendar year 1918, compiled by A. H. Fay. 1920. 23 pp.
- Technical Paper 257. Waste and correct use of natural gas in the home, by Samuel S. Wyer. 1920. 23 pp., 7 figs.

During the year 10 bulletins, 26 technical papers, 2 miners' circulars, and 17 other publications were printed, as follows:

Coal-mine fatalities-----	10
Annual report of the director-----	1
List of publications-----	1
Schedules of tests for permissible mine equipment-----	3
Reports on the standardization of petroleum specifications-----	2

There were 12 reprints published—4 bulletins, 3 technical papers, 3 miners' circulars, and 2 other publications.

EDITORIAL WORK.

During the year 10 bulletins, 26 technical papers, 2 miners' circulars, and 17 other publications were issued. The bulletins and technical papers were as follows: Bulletins 78, 95, 112, 162, 173, 175, 178B, 178C, 178D, 181, 183, and 196. Technical Papers 210, 211, 225, 226, 227, 229, 231, 232, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 247, 250, 252, 253, 256, and 257. The contents of the bulletins and technical papers and the nature of the other publications have been indicated in the preceding statement.

Four bulletins, three technical papers, three miners' circulars, and two other publications were reprinted in one or more editions. In addition to the work done on the publications enumerated the text of 15 other publications was edited, and illustrations for these were prepared for engraving. There were 43 reports and 2 reprints in the course of publication at the end of the fiscal year.

The editorial work continued in charge of S. Sanford, engineer.

DISTRIBUTION OF PUBLICATIONS.

The Bureau of Mines during the fiscal year 1920 distributed free of charge 813,061 copies of publications, as follows: Bulletins, 67,793; technical papers, 183,847; miners' circulars, 453,154; annual reports, 1,375; miscellaneous documents, 106,692.

The totals given above, however, do not represent the entire distribution of Bureau of Mines publications. The demands of the mining and allied industries upon the bureau for publications have been

so great that it has been impossible under the appropriations granted by Congress to keep on hand a supply of all of them for free distribution. The bureau, therefore, to meet the demands in some manner, has been compelled to affix a price on a few of its publications, and in such instances refers the applicants to the superintendent of documents, Government Printing Office, Washington, D. C., who is permitted by law to set a nominal price upon publications covering the cost of printing but not the cost of the investigations, which is borne by the Bureau of Mines. The bureau reasons that having made the investigations and obtained the valuable and timely data for the industries, and not then having money for the printing of the paper, it is to the best interests of the industries to request the superintendent of documents to print an edition for sale. During the fiscal year the bureau issued the following publications under such an arrangement with the superintendent of documents: Bulletin 95, "Glossary of the mining and mineral industry," 75 cents; Bulletin 150, "Electrodeposition of gold and silver from cyanide solutions," 25 cents; Bulletin 162, "Removal of the lighter hydrocarbons from petroleum by continuous distillation," 50 cents; Bulletin 173, "Manganese: Uses, preparation, mining costs, and the production of ferro-alloys," 30 cents.

These publications may be obtained only through the superintendent of documents, Government Printing Office, Washington, D. C., and at the prices affixed. The superintendent of documents is an official of the Government Printing Office and is not connected with the Bureau of Mines in any manner.

If the demands of the mining and allied industries continue to grow as in the past, and there is every evidence that they will, there will be increasing necessity, in order to give prompt and efficient service, to have more and more of its publications printed under similar arrangements, a price being affixed and the papers sold through the superintendent of documents. The bureau has found that such a plan is acceptable to the industries in that the prompt and efficient service is not to be weighed against the nominal cost.

In addition to this sale of certain of its publications, the bureau, as a rule, intends to print only a first edition of its free reports, and after this is exhausted the applicants will be referred to the superintendent of documents, who is supposed to have an edition of each publication for sale. In this way the superintendent of documents is selling each year about 35,000 copies of Bureau of Mines publications.

The work of the section continued in charge of John L. Cochrane, statistician.

LIBRARY.

The main library of the bureau is in the Interior Department building in Washington. There are branch libraries at the 13 experiment stations—Columbus, Ohio; Pittsburgh, Pa.; Ithaca, N. Y.; Minneapolis, Minn.; Urbana, Ill.; Bartlesville, Okla.; Golden, Colo.; Salt Lake City, Utah.; Tuscon, Ariz.; Seattle, Wash.; San Francisco, Calif.; Berkeley, Calif.; and Fairbanks, Alaska.

All books are interchangeable between the stations. Through inter-library loans 1,940 volumes were borrowed and returned; through purchase, exchange, and binding, 1,156 volumes were added to the library during the year. Including those for the branch libraries, 1,087 volumes were sent to the bindery. The libraries now contain about 17,560 volumes.

The library at Washington continued in charge of Mrs. E. F. Spofford.

MOTION PICTURES AND EXHIBITS.

The use of motion pictures is an important feature of the bureau's educational work in promoting safety and health among miners. The motion-picture films in the possession of the bureau are also loaned to individuals or organizations which intend to show them for educational purposes, especially the promoting of safety, health, welfare, and efficiency in the mining industry. They are not permitted to be shown where an admission fee is charged. Transportation charges must be borne by the borrower. This service has proved so popular that in many cases requests for the loan of a film can be filled only in the order in which it is received.

Most of the bureau's films have been donated by cooperating agencies that are desirous of promoting educational work in the mining industry. During the year a number of new films were secured, two of the most important being the "Story of coal" and the "Story of petroleum."

M. F. Leopold, of the Washington office, conducts the cooperative work with mining and other companies for the making of films of educational character bearing on the mining industry and renders technical assistance in the planning of the work of making the pictures. He has also made arrangements with motion-picture companies so that the bureau receives copies of motion pictures of events of special interest to the mining public.

The work of repairing films, storage of negatives, and distributing films for exhibition is conducted by the photographic laboratory at the Pittsburgh station under R. A. Wood.

The educational work of the bureau is further promoted by the preparation of exhibits showing various phases of its work. During

the year exhibits of this character were shown at a number of State fairs, at the National Exposition of Chemical Industries at Chicago, and in connection with the meeting of the American Mining Congress at St. Louis. The bureau also maintains an exhibit of educational character at its Pittsburgh station. These exhibits have been of great value in promoting a better knowledge of the mining industry, not only by the general public, but by those interested in the industry as well.

REFERENCE FILES ON THE MINING INDUSTRY.

The division maintains, at the Washington office, a general reference file on matters pertaining to the mining and mineral industries, for the benefit of the members of the bureau, officials of other Government organizations, and all other persons visiting the bureau in search of information on special topics. The file is being constantly enlarged, and in time will constitute one of the most complete files of its kind in the United States. Helen C. McGown, bibliographer, had charge of the general reference filing system.

SAFETY AND RESCUE WORK.

D. J. Parker, chief of the division of safety cars and stations, besides directing the mine rescue and safety work of the bureau personally supervised the work of the 10 rescue cars and 9 rescue stations and the testing of breathing apparatus at the Pittsburgh station.

COOPERATION WITH AIR SERVICE.

In the fall of 1919 the bureau investigated the possible use of airplanes in its rescue work for reaching quickly mine disasters. The Air Service of the Army, in response to an inquiry from the bureau, offered its cooperation and instructed those aviation fields nearest the headquarters of the bureau's district safety engineers to take up the matter of feasibility.

The preliminary survey indicated that planes might be effectively utilized in the flat-lying coal fields of Illinois and Indiana. Arrangements have been effected with the Air Service station at McCook Field to cooperate with the Bureau of Mines safety station at Vincennes, Ind., in furnishing planes when requested for carrying the district safety engineer or his assistants with rescue apparatus to mine disasters in the district. It is possible that such cooperative service may prove feasible in other districts.

An aerial map of the mining districts, showing safe landing places and other data, is essential. The Bureau of Mines engineers in their field of work are compiling data on surface conditions at the mines visited and making maps of places suitable for landing. The data will be submitted to the Air Service as fast as accumulated.

FIELD DISTRICTS OF RESCUE STATIONS AND CARS.

In order to conduct the mine-safety work to the best advantage the mining regions of the country are grouped within nine districts, planned with especial reference to convenience and efficiency. These districts are near the rescue stations and the headquarters of the rescue cars and do not coincide with the districts of the mining experiment stations of the bureau. The first consideration in locating headquarters of cars and the position of safety stations is that of mine distribution and of railroad facilities.

District headquarters and engineers in charge.

District.	Engineer in charge.	Headquarters.
A.....	D. J. Parker, chief, division safety cars and stations.....	Pittsburgh, Pa.
B.....	W. B. Plank, district engineer.....	Birmingham, Ala.
C.....	C. A. Herbert, district engineer.....	Vincennes, Ind.
D.....	C. E. Juhlén, district engineer.....	Minneapolis, Minn.
E.....	J. J. Rutledge, district engineer.....	McAlester, Okla.
F and H.....	Daniel Harrington, district engineer.....	Golden, Colo.
G.....	C. A. Allen, district engineer.....	Salt Lake City, Utah.
I.....	B. O. Pickard, district engineer.....	Berkeley, Calif.

District A.—Northern Appalachian district. Headquarters are at Pittsburgh, Pa., where the work is under the immediate supervision of D. J. Parker, chief of the division of safety cars and stations, assisted by E. H. Denny and G. S. McCaa. At the Pittsburgh station is a gallery for apparatus training and testing purposes, and a motor rescue truck that is used for emergency mine-disaster calls and for general training work in the vicinity of Pittsburgh. Car 3, with headquarters at Pittsburgh, serves the northern part of the district, and car 8, with headquarters at Huntington, W. Va., the southern part of the district. The mine rescue station in Norton, Va., serves the extreme southern part of the district.

District B.—Southern Appalachian district. Headquarters are at Birmingham, Ala., where there is a special Bureau of Mines building containing a training gallery and a motor rescue truck, which is used for training work and to answer emergency disaster calls in the mining district immediately surrounding Birmingham. The northern end of the district is served by a station in Jellico, Tenn. At the close of the fiscal year the station was moved to Knoxville, Tenn. W. B. Plank, mining engineer, is in charge of the work of this district.

District C.—Eastern interior district. The district headquarters are at Vincennes, Ind., where there is a mine safety station and motor rescue truck, used for training work and for getting to mine disasters. A similar station, with truck, is maintained at Evansville, Ind. Bureau of Mines car 9, with headquarters at Terre Haute, Ind., took care of the work in the Illinois-Indiana fields, and assisted in recovery work at one Ohio mine fire. Bureau of Mines car 7, with headquarters at Des Moines, Iowa, took care of similar work in Iowa and

eastern Missouri. The eastern interior district is in charge of C. A. Herbert, district engineer, assisted by J. J. Bourquin, engineer in charge of car 9.

District D.—Lake Superior district. This district was in charge of B. O. Pickard for the greater part of the year. Upon Mr. Pickard's transfer to district I, C. E. Julihn, with headquarters at Minneapolis, Minn., was placed in charge of the district. Car 10, R. V. Ageton, engineer in charge of car, serves the Lake Superior district, traveling through the mining regions of Wisconsin, Michigan, and Minnesota from its headquarters at Ironwood, Mich.

District E.—Southwestern district. J. J. Rutledge, district engineer, is in charge, with headquarters at McAlester, Okla., where there is a mine-rescue station containing a training gallery. The district was served by car 4, with headquarters at Pittsburg, Kans.

Districts F and H.—These districts comprise the States of Colorado, New Mexico, eastern Arizona, Montana, northern Wyoming, North Dakota, South Dakota, northern Idaho, Washington, and Oregon. Daniel Harrington, headquarters at Golden, Colo., is district engineer. The districts are served by car 2, in charge of J. J. Forbes, mining engineer, with headquarters at Raton, N. Mex., and car 5, in charge of B. W. Dyer, mining engineer, with headquarters at Butte, Mont. A rescue station, training gallery, and rescue truck are maintained at Seattle, Wash., for training and rescue work in the mining fields of the State.

District G.—Northern Rocky Mountain district. This district comprises the States of Utah, southern Wyoming, eastern Nevada, and southern Idaho. C. A. Allen, with headquarters at Salt Lake City, Utah, is district engineer. The district is served by car 11, with headquarters at Rock Springs, Wyo. R. V. Ageton was engineer in charge of the car until his transfer to the Lake Superior district.

District I.—Southern Pacific district. During the early part of the fiscal year the district was in charge of F. B. Hyder. Mr. Hyder was succeeded by B. O. Pickard, now district engineer in charge, with headquarters at Berkeley, Calif., where the rescue station, with motor rescue truck, is maintained. The district is also served by car 1, in charge of E. D. Gardner, mining engineer, with headquarters at Reno, Nev.

The itineraries of the safety cars and trucks are arranged by the engineers or by the foremen in charge, with concurrence of the district engineers and the approval of D. J. Parker, chief of the division of safety cars and stations, with headquarters at Pittsburgh, Pa.

The testing work of the division of safety cars and stations comprised the testing of various kinds of mine-rescue apparatus for safety, efficiency, and practicability. During the year tests were conducted at the Pittsburgh rescue station on various types of breath-

ing apparatus by G. S. McCaa, assistant mine safety engineer, and assistants, under the general supervision of D. J. Parker.

Tests were run under the provisions of Schedule 13, Bureau of Mines, and two types of breathing apparatus, the Gibbs and the Paul, were approved, subject to certain modifications, after the running of exhaustive tests.

RESCUE AND FIRST-AID INVESTIGATIONS AND TRAINING WORK.

The duties of the engineers, foreman miners, and first-aid miners in mine-rescue and first-aid work were chiefly rendering aid at mine disasters, training miners in rescue and first-aid, conducting first-aid and mine-rescue field contests.

The ten mine rescue cars were busy in training work during the entire year, although the epidemic of influenza curtailed work somewhat during the months of February and March, 1920. During this epidemic the surgeons and crews of the various cars offered their services to the public and the hospitals in the vicinities of their headquarters and did creditable work.

Training work was also conducted by the nine safety stations and six rescue trucks of the bureau.

An important duty of the employees of this division is to inspect rescue apparatus owned by mining companies, when requested by the companies concerned, and to give advice when desired as to its condition, and the repairs needed. Rescue apparatus and parts are particularly subject to deterioration. These apparatus are subject to use in irrespirable mine atmospheres at time of emergency or disaster and unless the apparatus is in proper shape, the lives of the wearers are imperiled.

The bureau employees advise mining operators of any defects found in apparatus, and emphasize the need of having the apparatus examined and tested at least monthly.

During the year a total of 28,586 persons visited the mine-safety cars and stations, and 40,516 attended the lectures given by the crews of the mine-rescue cars and stations.

Details of training given by the foreman miners and the first-aid miners are shown in the following table. The table also shows the number of visitors and number attending lectures at the cars and stations.

Record of training for the year July 1, 1919, to June 30, 1920.

Cars and stations.	Qualified certificates.				Additional training.					
	Com- bina- tion.	First aid.	Mine rescue.	Total.	Com- bina- tion.	First aid.	Mine rescue.	Total.	Number of visi- tors.	Number at- tend- ing lec- tures.
Car 1.....	91	162	21	274	13	40	3	56	3,741	5,259
Car 2.....	210	723	103	1,036	22	80	41	143	2,363	5,278
Car 3.....	313	529	32	874	18	91	31	140	3,777	94
Car 4.....	32	77	10	119	3	12		15	1,701	1,248
Car 5.....	263	523	147	933	23	60	19	102	1,732	6,180
Car 7.....	96	287	15	398	16	77		93	3,972	3,026
Car 8.....	185	282	43	510	11	3		14	2,415	2,163
Car 9.....	172	421	45	638	10	16		26	1,521	2,671
Car 10.....	135	388	84	607	10	15	10	35	1,677	490
Car 11.....	171	497	39	707	10	40	16	66	2,894	4,628
Pittsburgh.....	116	192	46	354	3		2	5	574	
Norton.....	3	790	129	922	21	128	7	156		
Jellico.....	2	236	26	264	3	45	1	49		3,734
Birmingham.....	52	517	3	572		27	3	30	999	4,325
Vincennes.....	61	268	20	349	9	124	9	142		
Evansville.....	8	67		75		11		11	519	210
McAlester.....		52		52		55		55	535	522
Seattle.....	51	56	5	112	4	15	1	20	69	666
Berkeley.....	12	172	13	197	11	14	1	26	97	24
Total.....	1,973	6,239	781	8,993	187	853	144	1,184	28,586	40,516

EXHIBITS AT STATE FAIRS.

During the summer and fall of 1919 the mine-rescue cars of the Bureau of Mines participated in three State fairs and gave demonstrations in first-aid and mine-rescue work. The fairs were as follows: Wisconsin State Fair, Milwaukee, Wis., September 8, to 13, 1919, car 10; Kansas State Fair, Topeka, Kans., September 8 to 13, 1919, car 1; Illinois State Fair, Springfield, Ill., August 15 to 23, 1919, car 9.

MINE ACCIDENTS AT WHICH ASSISTANCE WAS RENDERED BY THE DIVISION OF SAFETY CARS AND STATIONS.

During the year assistance was rendered by the division of safety cars and stations at 27 mine accidents, 17 of these accidents being at coal mines and 10 at metal mines. A list of the accidents appears in the table following:

Mine accidents at which assistance was rendered by the division of safety cars and stations.

Name of mine.	Location.	Date.	Killed.	In- jured.	Res- cued.	Escaped unass- isted.	Appa- ratus used.	Hours appa- ratus worn.	Died wearing appa- ratus.	Nature of accident.	Car, station, or truck.
Armour, No. 2.	Crosby, Minn.	1919.									
Richard	Short Creek, W. Va.	July 8								Mine fire.	Car 7.
Pacific Coast.	Black Diamond, Wash.	July 4								do.	Car 8.
No. 3 shaft, Carswell	Kimball, W. Va.	July 10	3	5	5				3	Training in gaseous area.	Truck 3.
mine.		July 18	6							Explosion.	Car 8.
Oakdale, No. 2.	La Veta, Colo.	Aug. 18	18	3	3	82	8	16		Mine fire.	J. J. Forbes.
Welwood.	Pax, W. Va.	Aug. 6								Gas explosion.	Car 8.
Zimmerman.	Clinton, Ind.	July 29			5					Explosion.	Truck 5.
Hercules.	Burke, Idaho.	Sept. —								Mine fire.	Car 5.
Y. & O., No. 1.	Amsterdam, Ohio.	Oct. 31	20				25	96		do.	Cars 3, 9 and Pittsburgh station.
Homestake.	Lead, S. Dak.									do.	Car 5.
American, No. 1.	Bicknell, Ind.	Nov. 8					12	104		do.	Car 9, truck 5.
Gold Hunter.	Mullan, Idaho.	Nov. 15			4					do.	Car 11.
Buckskin.	Buckskin, Ind.	Dec. 17	2							Shot-firer's explosion.	J. J. Bourquin, Archie and Wm. Forbes, Powell.
Laurhill.	Martins Ferry, Ohio.	1920.									
Black Betty.	Clinton, Ind.	Jan. 6				17				do.	Car 3.
Kennedy.	Jackson, Calif.	Feb. 17		3	3					do.	Truck 5.
Morning.	Mullan, Idaho.	Mar. 6					4	2		Mine fire.	Truck 6.
Briggs.	Bisbee, Ariz.	Mar. 7					10	300		do.	Car 5.
No. 6 mine, Phelps	Dawson, N. Mex.	Mar. 29								do.	Car 2.
Dodge.		Apr. 14		5	5		10	4		Mine fire.	J. J. Forbes.
Superior.	Chehalis, Wash.	Apr. 3								do.	J. G. Schoning.
New, No. 5, Doxnan	Willborton, Okla.	Apr. 6	3							do.	W. W. Fleming.
McConnell.											
Submarine.	Clinton, Ind.	May 4	5	7						Gas explosion.	Truck 5.
Mine No. 2.	Ethel, W. Va.	May 12								Shot-firer's explosion.	Car 8.
Marsh mine.	Burke, Idaho.	May 14	3	2			8	8		Mine fire.	B. W. Dyer.
No. 2 mine, Aracoma	Loan, W. Va.	June 3								Shot firing.	Car 8.
Coal Co.											
Ontario shaft.	Cokeburg, Pa.	June 10					6	2		Gas explosion.	Pittsburgh station.
Smiley	Near Fairchance, Pa.	June 17	6				2	2		Mine fire.	Do.

A number of mine accidents, in addition to those listed in the foregoing table, were investigated by engineers of the mining division and mechanical division.

TOWNS AT WHICH MINE-RESCUE AND FIRST-AID TRAINING WAS GIVEN DURING THE YEAR ENDED JUNE 30, 1920.

Alabama.—Birmingham, Palos, Garnsey, Yolande, Carbon Hill, Sipsey, Sayre, New Castle, Littleton, Raimund, Lewisburg, Goethite, Reno, Kellerman, Empire, Roebuck, Hull, Dora, Mulga, Dixiana, Majestic, Holly Grove, Cordova.

Arizona.—Oatman, Clarkdale, Stoddard, Mayer, Humboldt, Verde, Jerome, Ajo, Tucson, Bisbee, Morenci, Metcalf, Globe, Clifton, Copper Hill, Inspiration.

Arkansas.—Greenwood, Spadra, Prairie, Paris, Denning.

California.—Death Valley, Lang, Quartz, Keswick, Idria, Martinez, Jackson, Plymouth, Grass Valley, Stanford.

Colorado.—Mount Harris, Oak Creek, Vanadium, Gardner, Trinidad, Rockvale, Aguilar, Brodhead, Coal Creek, Radiant, Golden, Pictou, Camp Shumway, Delcarbon, Strong, Maitland, Tloga, Primero, Ojo, Oakview.

Georgia.—Dahlonega.

Idaho.—Burke, Mullan, Tamarack, Kellogg, Moscow, Salmon, Gilmore, Mackay, Montpelier.

Illinois.—Hanna City, Gillespie, Pekin, Glasford, Staunton, Virden, Farmington, Pana, Duquoin, Toluca, Cherry, Granville, Standard, Sandoval, Centralia, Cedar Point, Sesser, Christopher, La Salle, West Frankfort, Orient, Zeigler, Eldorado, Belleville, Collinsville, Carlinville, Springfield.

Indiana.—Washington, Evansville, Bicknell, Jasonville, Sullivan, Shelburn, Dugger, Clinton, Wilfred, Brazil, Terre Haute, Cass, Bruceville.

Iowa.—Ogden, Boone, Fort Dodge, Des Moines, Hiteman, Buxton, Consol, Bidwell, Mystic, Centerville, Chariton, Melcher, Olmitz, Hamilton, Rex.

Kansas.—Ringo, Girard, Osage City, Lawrence, Leavenworth, Scammon, Gross.

Kentucky.—Chavies, Dekoven, Madisonville, Echols, Weeksbury, Wheelwright, Whalen, Norton, Garrett, Burchfield, Jenkins, Harlan, Straight Creek, Bosworth, Winona, Kentenia, Lejunior, Dizney, Kitts, McRoberts, Burdine.

Michigan.—Diorite, Ishpeming, Negaunee, Gwinn, Marquette, Jessleville, Bessemer, Ironwood, Wakefield, Ramsay, Verona, Iron River, Alpha, Palatka, Crystal, Amsa.

Minnesota.—Aurora, Ely, Gilbert, Biwabik, Minneapolis.

Missouri.—Rolla, Huntsville, Novinger, Waverly, Marcelline.

Montana.—Butte, Stockett.

Nevada.—Mina, Tonopah, Goldfield, Reno, Pioche, McGill, Ruth, Austin.

New Jersey.—Perth Amboy, Franklin.

New Mexico.—Allison, Gibson, Madrid, Dawson, Van Houten, Koehler, Swastika, Brilliant, Sugarite.

Oklahoma.—Krebs, Halleysville, Calhoun.

Pennsylvania.—Barnesboro, St. Benedict, Lilly, Nanty Glo, Johnstown, Hannastown, Greensburg, Hellwood, South Fork, Crucible, Fredericktown, Brownsville, Mount Braddock, Republic, Allison, Elizabeth, Starford, Simpson, Alicia, Hillcoke, Masontown, Dilltown, Seward, Heshbon, Indianola, Creighton, Curtisville, Harwick, Acosta, Bairdford, Johnetta, Buck Run, Pittsburgh, Stewarts, Orient, McDonald, Colver, Star Junction, Renton, Van Voorhis, Noblestown, Canonsburg, Wilkes-Barre, Luzerne, Mahonoy Plane, Lees, Dunmore, Beaver, Brook, Providence, Shaft, Lansford, Minooka, Tamaqua, Coaldale, Nesquehoning, West Hazleton, Harwood, Upper Lehigh, Hyde Park, St. Clair, Hudson, Wilburton, Beaver Meadows, Darkwater, Maryd.

South Dakota.—Lead, Rapid City.

Tennessee.—Mascot, Maryville, Fork Ridge, Bryson Mountain, Hartranft, Bryson, Beachgrove Mine, Peabody.

Texas.—Petroliia.

Utah.—Alta, Bingham, Ophir, Eureka, Salt Lake City, Dividend, Park City, Scofield, Clear Creek, Castlegate, Hiawatha, Mohrland, Storrs, Standardville, Kenilworth, Sunnyside, Watson, Sego, Gold Hill.

Virginia.—Keokee, Big Stone Gap, Drill, Esserville, Roaring Fork, Wilder, Stonega, Dorchester, Wise, Glamorgan, Toms Creek, Vico, Virginia City, Norton, Inman, Sutherland, Crane, Roda, Osaka, Clinchco, Dante, St. Charles.

Washington.—Bayne, Durham, Burnett, Spiketon, Black Diamond, Wilkeson, Carbonado, Seattle, Roslyn, Pullman, Bellingham, Fairfax.

West Virginia.—Morgantown, Loulse, Broomfield, Coalwood, Marytown, Twin Branch, Gary, Kimball, Vivian, Eckman, Keystone, Northfork, Welch, Mount Hope, Wheeling, Fairmont, Norton, Thomas, Holden, Monaville, Omar, Ethel, Earling, Amherstdale, Lundale, Logan.

Wisconsin.—West Allis, Madison, Platteville, Pence, Hurley.

EXPLOSIVES REGULATION.

On July 19, 1919, all restrictions regarding explosives which had been imposed under the explosives regulation act (40 Stat., 385) approved October 6, 1917, amended July 19, 1919, were removed with the exception of the licensing requirements for the manufacturing, exporting, and importing of explosives. These classes of licenses are still required, and will continue to be, until peace is declared or the law repealed.

USE OF SURPLUS WAR DEPARTMENT EXPLOSIVES.

During the early part of the past year the Secretary of War turned over to the Secretary of the Interior certain amounts of trinitrotoluol (TNT) and other explosives that had been declared surplus by the Department of War, to be used in the work of the Interior Department. Allotments of these explosives were to be distributed to the different branches of the Interior Department or released to the War Department in order that that department might be able to fill requests received from the Department of Agriculture. Approximately 30,000,000 pounds of explosives were thus made use of in Government work, with a resultant saving to these departments of approximately \$10,000,000. Excellent results have been obtained in the use of the explosives by the various branches of the Government in its road building and other work.

GOVERNMENT FUEL YARD.

INTRODUCTION.

The sundry civil bill for the fiscal year 1918 provided for the establishment, maintenance, and operation of a Government fuel yard. The act imposes on the fuel yard the responsibility of buy-

ing fuel and distributing it to all of the Federal and municipal plants within and contiguous to the District of Columbia, with the single exception of the Navy Yard. The distributing points number approximately 725 and the fuel consumption is about 275,000 tons annually.

The principal factors contributing to the creation of a Government owned and operated yard were briefly:

1. To centralize the purchase and distribution of the Government's fuel requirements. Prior to 1910 some 50 offices purchased fuel for the Federal and municipal heating plants in the District of Columbia. In that year the General Supply Committee, composed of representatives from each of the Government departments, was created by act of Congress. Its authority extended only to the issuance of specifications and solicitation for bids, with a view to awarding contracts for the Government's annual requirements. The inspection section of the Bureau of Mines, at the request of the supply committee, made analyses and tests of coals offered in the proposals or bids and presented recommendations for the award of contracts. With the committee's field of operations limited to the issuance of proposals and awarding of contracts, the several offices continued to look after the acquisition of their fuel requirements individually, the only difference from the former method of obtaining coal being that they were restricted to the contracts awarded by the supply committee, except under emergency conditions. Obviously such a method did not possess the advantages of empowering one office to contract for the purchase and distribution of the Government's annual fuel requirements.

2. The fuel shortage during the winter of 1917-18 brought forcibly to the front the advantage of a centralized purchasing and distributing organization. Washington, in common with other cities of the eastern seaboard, suffered from the general fuel shortage, brought about by a combination of bad-weather conditions, congestion of railroad traffic, and a lessened output of coal.

3. As the local dealers were unable to meet the conditions that obtained during the period of fuel shortage, the Interior Department decided upon the policy of obtaining its own coal direct from the mine operators. To this end it acquired two 5-ton trucks, a yard and trestle, and, with these facilities, handled its requirements of 13,000 tons. In so doing it not only avoided a coal shortage but demonstrated that in its purchases and distribution it had effected a material saving.

4. Another important factor in the establishment of a central yard was the need for providing facilities for taking coal into storage in the summer as a protection to plants having but little storage space.

In nearly every plant where delivery is required by truck little bin space is provided. Hence such plants would, within a few days, be without coal in time of a fuel shortage.

Congress was so impressed with the arguments that it directed the Secretary of the Interior to establish storage and distributing fuel yards. The Secretary assigned the work to the Bureau of Mines.

PERSONNEL.

The number of employees necessarily varied with seasonal demands. The total expenditure for salaries for the fiscal year 1920 was \$109,886.08. The working force necessary for the prompt execution of all phases of the operations is shown by the organization chart below.

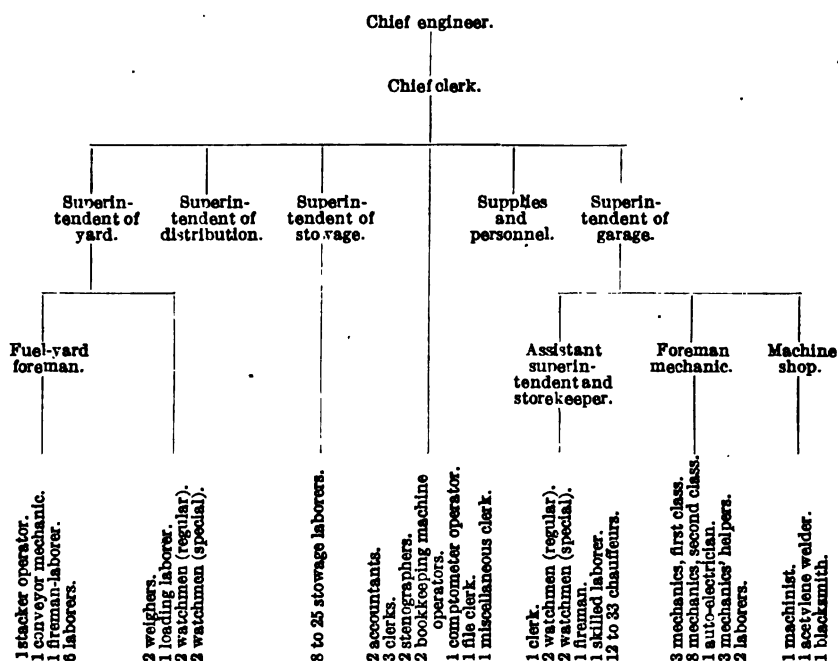


FIGURE 1.—Organization chart of Government fuel yard as of June 30, 1920.

YARD.

The installation of a permanent yard, begun in the winter of 1918-19, was not completed until early in the present fiscal year. Summer and winter requirements for fuel vary widely, hence in the study of different types of equipment consideration was given to seasonal fluctuations as affecting the motor equipment and labor. An effort was made so to design the yard that the trucks could be loaded in minimum time with minimum labor in order to prevent large increases in the operating force during the winter. Incidentally it

was also desirable to keep at a minimum the number of trucks in service, and attention was directed toward making the distribution or trucking independent of the receiving or unloading operations.

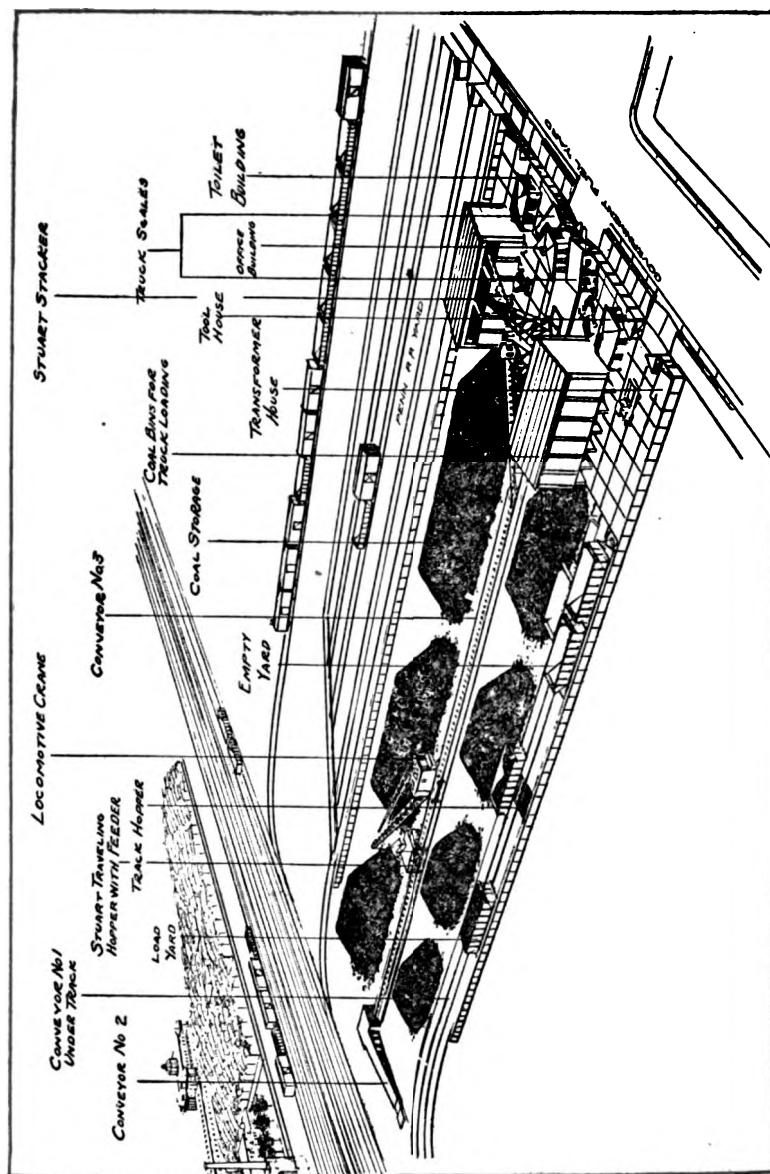


FIGURE 2.—Storage system at government fuel yard; automatic stacking, reclaiming, and loading devices and bins for filling trucks.

Accordingly consideration was given only to those types of coal-handling equipment that provided for the unloading of incoming coal independently of delivery, and conversely for delivery work equally independent of unloading.

Coal arriving in standard hopper-bottom cars on the main line of the railroad is switched on to one of the two tracks. Each spur has a capacity of 16 cars, 8 in the unloading space and 8 in the space for empties beyond the hoppers, or a total of 32 cars for the two spurs. As the spur track has a down grade of $1\frac{1}{2}$ per cent from the main line, the cars are easily moved by the laborers who spot them above the unloading hoppers and after unloading are easily moved to the track for empties.

The coal descends through the hoppers to the conveyor running beneath, which has a capacity of 250 tons per hour. The coal in passing over the conveyor is automatically weighed by an electric conveyor scale.

The No. 1 conveyor delivers its coal to cross conveyor No. 2, which in turn delivers to conveyor No. 3. Conveyor No. 3, reeved through an inclined movable platform (termed the stacker), is elevated and delivers coal to a swinging boom, or conveyor No. 4, which is a part of the stacker. The delivery end of conveyor No. 4 may be raised or lowered as desired. The stacker can be moved under its own power, up or down the yard, and coal may be delivered by conveyor No. 4 either direct to the loading bins or else to the storage spaces on each side throughout the length of conveyor No. 3.

There are 12 bins, 6 on each side of the yard. Each bin has a capacity of 100 tons. The bins are self-clearing, each being equipped with a pair of discharge gates. The only labor required to load a truck is that of opening the gates. Each pair of gates is large enough to load a $7\frac{1}{2}$ -ton truck in one minute. There is, therefore, no delay in loading the trucks, and minimum time is required for loading, as the trucks move into the yard, pass under the bins, receive their loads, pass on in a semicircular path to the scale, and then into the street.

If the quantity of coal received in a day exceeds the capacity of the bins, the stacker can be withdrawn under its own power to any point in the yard and the surplus coal placed in storage. When it is desired to reclaim this coal, a locomotive crane, which travels on the same track as the stacker, removes it from the storage piles and dumps it into a traveling hopper above conveyor No. 3, which delivers it through the stacker to the loading bins. The bins may, therefore, be filled direct from the railroad cars by means of the track hoppers and conveyors 1, 2, 3, and 4, or from storage by means of the locomotive crane, traveling hopper and conveyors 3 and 4, or by both means acting simultaneously. Thus whenever deliveries by truck exceed the amount of incoming coal the necessary amount can be reclaimed from storage. Between the rates of a maximum of incoming coal and a minimum of deliveries, and a minimum of incoming coal and a maximum of deliveries, any possible combination can be handled without ever. Plate II shows conveyor No. 3, with stacker and storage bins subjecting either the unloading or delivery forces to any delay what-in the distance.

The yard was so nearly completed on June 9, 1919, that unloading coal direct from hopper through bins to trucks could begin. Storage of coal in the yard could not begin until the floor space was concreted. This was completed in October. Although the anthracite tonnage to be moved is small compared with the total tonnage handled, yet storage spaces for all sizes, excepting those smaller than pea coal, are required. This necessitated the construction of eight wooden partitions to provide storage spaces, with capacities ranging from 250 to 750 tons for the different sizes of anthracite.

STORAGE.

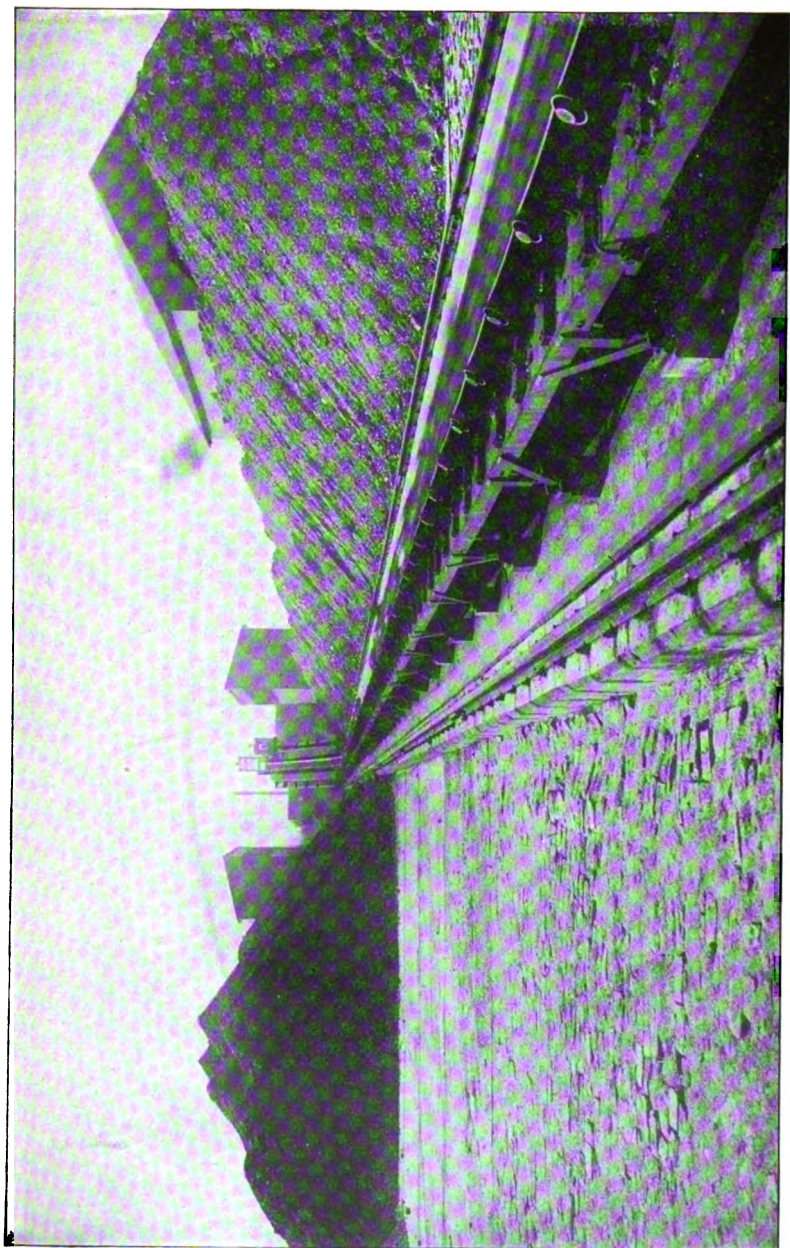
Pending the completion of the contracts for concreting and construction of partitions, it was impracticable to put into storage any considerable quantity of coal. As a protection against interference with or stoppage of the regular receipt of shipments, coal was placed in storage as the concreting of the yard progressed. To further protect the Government consumers against a coal shortage, as early as May 1, 1919, steps were taken to fill the storage spaces in the Federal and District buildings, so that on November 1, when the bituminous miners' strike became effective, there was built up a storage of approximately 38,000 tons in the yard and in consumers' bins. While two of the shippers were not materially affected by the strike, the receipts of coal were so reduced that some of the Government plants would have been without fuel but for that in reserve at the yard. The reserve coal was drawn upon in the months of November and December and was practically exhausted by the 1st of January. At that time coal was difficult to obtain, but by effort enough was procured to meet the daily requirements of 1,400 to 1,500 tons.

In March the consumption decreased somewhat, but shipments were held at the same rate as in the months of January and February, so that a new storage reserve in the yard of about 7,000 tons was accumulated by the 1st day of April, when coal contracts expired. Without this storage reserve the coal situation would have been most critical in April, May, and June on account of sporadic strikes of railroad employees, culminating in the breakdown of transportation and a shortage of fuel, a condition that has prevailed more or less acutely ever since.

GARAGE.

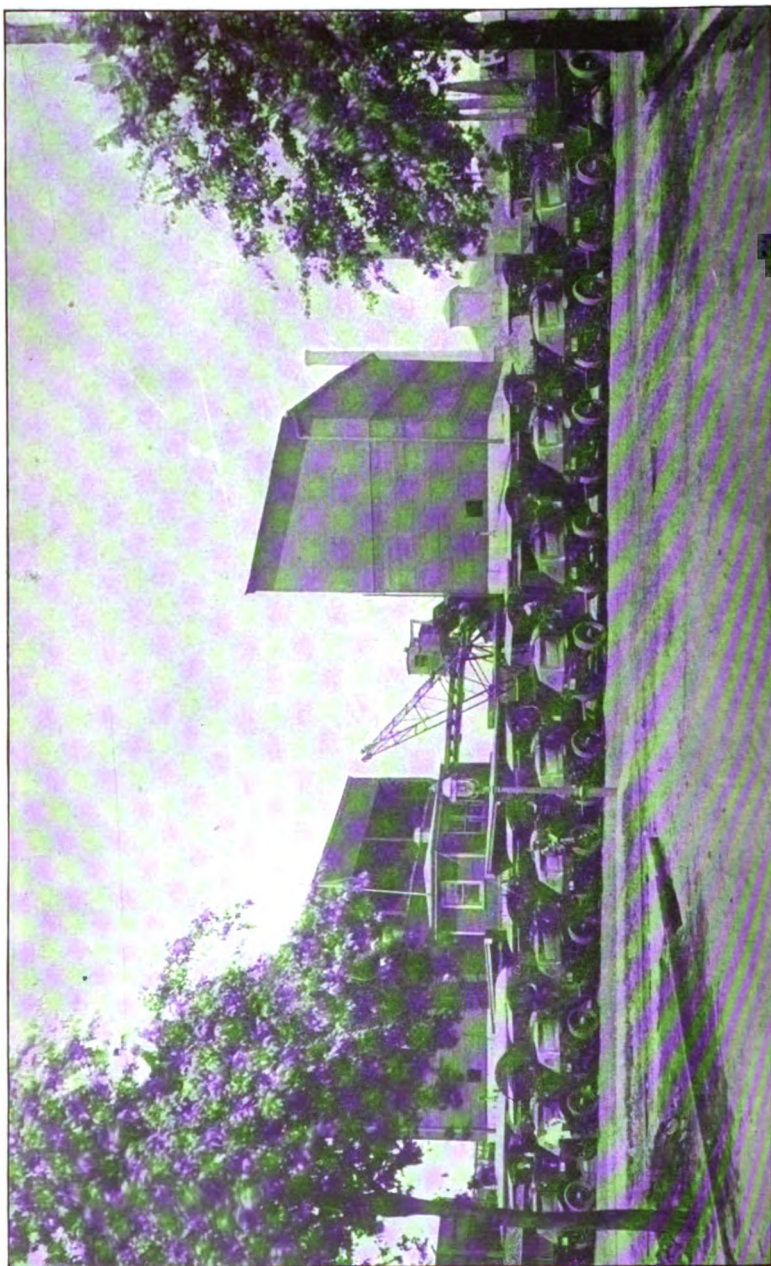
The fuel yard began operations with two trucks. This number was, of course, wholly inadequate. Trucks, equipped with hydraulic hoists and dump coal bodies, were obtained gradually in 1918 until the fleet numbered 33 trucks; 13 of $7\frac{1}{2}$ -ton, 15 of $5\frac{1}{2}$ -ton, and 4 of 2-ton, and 1 of 1-ton capacity. These, with four passenger machines of

PLATE II.



CONVEYOR NO. 3 AND STORAGE PILES; STORAGE BINS IN BACKGROUND.

PLATE III.



PART OF THE FLEET OF TRUCKS, WITH STORAGE BINS AND CONVEYOR NO. 4.

the roadster type for inspectors and a small service truck, constitute the motor equipment. Plate III shows part of the fleet.

Washington was so congested in the summer and fall of 1918 that there was little choice in the selection of a building suitable as a service garage. A building with an area of 14,600 square feet at 58 B Street S. W. was leased; it did not provide enough space for a machine shop, so an adjacent building, having about 900 square feet of space, was leased, and the necessary tools were installed therein. These buildings at one time had been used as an old street car barn, and in order to fit them for use as a service garage improvement was necessary, such as the installation of a heating system, repair pit, light and power lines, stock room, wash room, and oil and gasoline tanks.

Only major repairs to radiators and wheels are done by outside firms. All other machine work is done by the machine shop. As the fuel yard's equipment is standardized, new replacement and repair parts can be readily and cheaply purchased, thereby reducing the amount of machine work required.

STOWAGE.

As the fuel yard began operations on the day the law was approved (July 1, 1918), the chief engineer was too much occupied with the major features of its organization, such as trestle improvements and acquisition of garage and yard sites, to give consideration to the stowage of coal—that is, to carrying or wheeling coal from the point dumped by the trucks into the consumers' bins. It was decided to contract for this service on the basis of 69 cents per ton for coal and \$1.50 per cord for wood. The amount expended for such labor under that contract was \$27,813.54, which was considered excessive; steps were taken, therefore, to have the fuel yard's organization handle this work. Approximately 45,500 tons of coal were stowed during the year, at an average cost of 40.4 cents per ton; and, although approximately 5,000 tons more coal were stowed in this than in the previous fiscal year, the saving to the Government over that expended in the fiscal year 1919 was more than \$9,000.

OPERATING COST.

During the year 266,942.39 tons of coal, 689 cords of wood, 1,122.2 bushels of charcoal, and 22.9 tons of coke were handled. All but 73,463.58 tons was delivered by truck at an average handling cost of \$1.138 per ton. This price embraces the cost of rehandling incident to the reclaiming of 17,562.17 tons. The total cost of this fuel to the departments was \$1,904,071.51. The prime or basic cost to the fuel yard was \$1,674,147.14, leaving a margin of gross profits of \$229,924.37 for the total cost of operations. The operating costs are detailed in table following:

Government fuel yards operation statement fiscal year 1920.

		Selling price.		Prime cost.		Gross profit.	
	Gross tons.	Total.	Per ton.	Total.	Per ton.	Total.	Per ton.
YARD DELIVERIES.							
Direct from car to truck:							
Kind of coal:—							
Pennsylvania.....	90,148.49	\$621,065.90	\$6.89	\$525,336.25	\$5.83	\$95,729.65	\$1.06
New River.....	60,841.85	418,961.64	6.88	346,871.48	5.70	71,990.13	1.18
Jerome.....	1,053.97	6,248.54	5.93	5,081.39	4.83	1,157.15	1.10
Splint.....	16.97	117.24	6.91	97.30	5.73	19.94	1.18
Furnace.....	7,700.61	75,022.94	9.74	66,758.85	8.67	8,264.09	1.07
Egg.....	6,785.81	68,321.24	10.06	60,914.84	8.97	7,406.40	1.09
White ash stove.....	6,639.67	68,531.02	10.32	61,276.66	9.23	7,254.36	1.09
Red ash stove.....	240.33	2,581.50	10.53	2,278.01	9.48	253.49	1.05
Chestnut.....	361.60	3,824.28	10.57	3,363.47	9.30	460.81	1.27
Pea.....	2,129.34	18,709.71	8.78	16,390.81	7.69	2,318.90	1.09
Total.....	175,916.64	1,283,233.98	.....	1,088,379.06	.....	194,854.92	1.11
Reclaimed from storage:							
Pennsylvania.....	7,470.60	51,877.84	6.94	42,432.53	5.68	9,445.31	1.26
New River.....	6,720.09	46,983.65	6.99	37,916.28	5.64	9,067.37	1.35
Jerome.....	93.47	636.32	6.80	461.41	4.93	174.91	1.87
Splint.....	69.56	490.79	7.05	441.65	6.24	49.14	.71
Furnace.....	401.05	3,994.71	9.96	3,453.54	8.61	541.17	1.35
Egg.....	650.37	6,690.73	10.28	5,825.48	8.95	865.25	1.33
White ash stove.....	400.33	4,256.32	10.63	3,701.40	9.24	554.92	1.39
Red ash stove.....	160.60	1,733.65	10.79	1,526.49	9.50	207.16	1.29
Chestnut.....	265.02	2,827.59	10.67	2,464.68	9.30	362.91	1.37
Pea.....	937.16	8,502.71	9.07	7,316.04	7.80	1,186.67	1.27
Buckwheat.....	387.33	2,639.07	6.81	2,134.19	5.51	504.88	1.30
Coke.....	6.59	79.70	12.09	63.92	9.70	15.78	2.36
Total.....	17,562.17	130,713.68	.....	107,737.61	.....	22,975.47	1.31
DIRECT DELIVERIES.							
Pennsylvania.....	61,743.03	364,604.80	5.90	358,087.83	5.80	6,516.97	.10
New River.....	3,123.19	18,478.63	5.91	18,153.61	5.81	325.02	.10
Jerome.....	1,018.70	5,044.62	4.95	4,922.38	4.83	122.24	.12
Star.....	1,966.65	10,855.91	5.52	10,619.92	5.40	235.99	.12
Gas.....	1,432.19	7,852.04	5.48	7,679.43	5.36	172.61	.12
Egg.....	1,587.83	14,388.56	9.06	14,197.95	8.94	190.61	.12
White ash stove.....	3,462.73	32,678.12	9.44	32,205.89	9.30	472.23	.14
Nut.....	250.78	2,380.52	9.49	2,351.65	9.37	28.87	.12
Pea.....	135.25	1,112.88	8.23	1,102.17	8.15	10.71	.08
Buckwheat.....	210.60	1,322.42	6.28	1,305.76	6.20	16.66	.06
Rice.....	532.63	2,646.29	4.96	2,582.54	4.84	63.75	.12
Total.....	73,463.58	461,364.79	.....	453,209.13	.....	8,155.66	.11
MISCELLANEOUS.							
Wood (1 cord equivalent to 3 tons) 689 cords.....	2,067.60	9,545.81	.....	7,456.63	.....	2,089.18	.....
Stowage—43,861 tons, 496 cords =1,489 50 tons.....	45,350.50	18,341.95	.....	16,571.17	.....	1,770.78	.....
Charcoal (bushels).....	1,122.20	627.01	.....	596.60	.....	30.41	.....
Coke.....	22.90	244.89	.....	196.94	.....	47.95	.....
Total.....	.....	28,759.66	.....	24,821.34	.....	3,938.32	.....
SUMMARY.							
Yard sales.....	175,916.64	1,283,233.98	.....	1,088,379.06	.....	194,854.92	.....
Storage sales.....	17,562.17	130,713.68	.....	107,737.61	.....	22,975.47	.....
Direct sales.....	73,463.58	461,364.79	.....	453,209.13	.....	8,155.66	.....
Wood.....	2,067.60	9,545.81	.....	7,456.63	.....	2,089.18	.....
Charcoal..... bushels.....	1,122.20	627.01	.....	596.60	.....	30.41	.....
Stowage..... tons.....	45,350.50	18,341.95	.....	16,571.17	.....	1,770.78	.....
Coke.....	22.90	244.89	.....	196.94	.....	47.95	.....
Total.....	299,032.89	1,904,071.51	.....	1,674,147.14	.....	229,924.37	.....

¹ Coal.

OPERATING EXPENSES.

Gross profit.....	\$229,924.37
Yard, 195,569.31 tons.....	\$40,255.89 (0.206 per ton)
Garage, 195,569.31 tons.....	127,239.01 (0.65 per ton)
Overhead, 269,032.89 tons.....	25,440.69 (0.094 per ton)
Leasehold improvements and depreciation of equipment.....	30,988.78 (0.158 per ton)
Total.....	229,924.37 (1.138 per ton) 229,924.37

229,924.37 (1.138 per ton) 229,924.37

To enable one to follow the table at a glance, the headings may be briefly explained: "Direct from car to truck" indicates the coal that is unloaded from the car onto the conveyor belt, conveyed direct to bins, and from there loaded into the trucks. Coal "Reclaimed from storage," on the other hand, is coal that had previously been conveyed from the unloading hopper to some point into the yard and placed in storage, from which point it is reclaimed and distributed by trucks. "Direct delivery" represents the coal or fuel that is consigned directly to consumers having railroad sidings or wharves. Under the head "Selling price" is recorded the money value of the coal delivered to the Federal and municipal establishments. The average selling price per ton is, of course, averaged over the year. "Prime cost" is the fuel cost plus transportation charges; in other words, it is the price of the fuel f. o. b. Washington. The "Gross profit" represents the difference between the selling price and the f. o. b. Washington price; it is in fact the handling charge.

The fluctuations in the per ton averages of the gross profits are due to (1) variation in the prime cost of coal, especially diverted coal, which was taken up at the time of delivery at an estimated price, for the actual cost was not and could not be determined until several weeks and sometimes months later, and (2) delivery of a given type of coal within the period of one price only; for example, the overhead charge of buckwheat coal is 8 cents, which means that none of this coal was delivered in any month when more than 8 cents was charged.

The "Gross profit" is in reality the operating expense. Under the law the Government fuel yard is required to charge the departments for the cost of its maintenance. The prices, therefore, are varied from time to time to meet fluctuations in the cost of the services rendered or prime cost of the fuel.

The operating expenses are likewise summarized and distributed over the respective branches of the work. The average cost per ton for the yard was 23.6 cents; for the garage, 65 cents; for overhead, 9.4 cents; and for leasehold improvements and depreciation of equipment other than motor equipment, 15.8 cents. In depreciation of equipment no cost is taken up for motor and other equipment at the yard, which was purchased from an appropriation providing specifically for the establishment of the yard, but equipment purchased from the appropriation for maintenance and operation of the fuel yards is depreciated. To depreciate equipment purchased from the original appropriation for establishment would have increased the second-named appropriation, which is in operation a revolving fund. However, equipment purchased from the maintenance and operation fund is properly and legally made subject to depreciation in order

to avoid depleting the amount originally appropriated. It may be said, further, that such items as interest on investment, taxes, and insurance are not regarded because they can not be legally charged. The leasehold improvements are repairs and improvements to buildings and grounds.

It may be of interest to analyze further the expense of the operation of the yard and garage. A detailed analysis can be given for only a nine months' period (October 1 to June 30), since a change in the accounting systems to provide such detailed information was not put into effect until October 1, 1919. The yard operating cost may be analyzed as follows:

Stacker and conveyor.....	\$4,061.75
Unloading cars (3,009).....	6,309.05
Reclaiming coal.....	3,306.75
Loading and weighing trucks.....	2,096.13
Overhead.....	19,720.29

The "overhead" embraces such charges as rental (\$9,250 per annum), power and light current (\$3,245), heat, and salaries of supervising employees and watchmen.

The garage cost for the period of nine months is summarized in the table following:

Analysis of cost of truck operations, Oct. 1 to June 30.

	Trucks.	Miles.	Trips.	Tons.	Ton-miles.	Avail- able, not used.	Days operated.	Laid up for repairs.	Gas (gallons).	Oil (quarts).	Grease (pounds).
7½-ton equipment.....	13	76,221	13,140	90,562.62	268,476.223	425	1,801½	717½	37,993	7,446	269
Average per mile.....									498	.097	.003
Average per ton.....									418	.081	.002
5½-ton equipment.....	14	77,999	13,321	67,574.16	197,316.5472	646	1,858	854	39,346	8,452	318
Average per mile.....									593	.108	.004
Average per ton.....									582	.125	.004
2-ton equipment.....	4	18,568	3,415	7,602.86	5,322.002	245	518	165	6,079	602	24
Average per mile.....									328	.032	.001
Average per ton.....									799	.079	.008
1-ton equipment.....	2	1,182	231	315.555	804.665	141½	75½	40	465	108	1
Average per mile.....									393	.091	.008
Average per ton.....									1,473	.342	.008
Operating expenses.											
	Gas.	Oil.	Grease.	Material.	Labor.	Tires.	Driver (wages).	Overhead.	Total.		
7½-ton equipment.....	\$9,001.01	\$906.11	\$33.33	\$9,619.92	\$3,835.28	\$5,495.83	\$7,293.47	\$16,333.72	\$52,378.87		
Average per mile.....	.118	.012	.004	.126	.05	.072	.095	.214	.899		
Average per ton.....	.099	.01	.003	.105	.042	.06	.08	.179	.578		
Average per ton-mile.....	.0342	.0036	.0001	.0306	.0145	.0208	.0276	.0419	.1985		
5½-ton equipment.....	9,379.43	977.42	37.55	8,812.95	4,669.51	2,645.76	7,239.46	15,630.65	49,392.73		
Average per mile.....	.12	.012	.004	.112	.059	.033	.092	.200	.533		
Average per ton.....	.138	.014	.005	.13	.069	.039	.107	.231	.720		
Average per ton-mile.....	.0476	.0049	.0001	.0446	.0236	.0134	.0346	.0792	.250		
2-ton equipment.....	1,427.26	70.28	2.50	1,273.90	613.19	405.72	1,841.09	3,032.40	8,566.34		
Average per mile.....	.0774	.003	.001	.083	.033	.021	.099	.183	.462		
Average per ton.....	.187	.009	.003	.154	.08	.053	.242	.398	1.126		
Average per ton-mile.....	.268	.0132	.0004	.2205	.115	.076	.3459	.6997	1.6966		
1-ton equipment.....	127.82	14.68	.09	87.00	83.09	15.06	149.66	814.25	1,290.65		
Average per mile.....	.108	.012	.00007	.073	.07	.012	.091	.168	.401		
Average per ton.....	.405	.046	.002	.275	.203	.047	.474	2.577	4.09		
Average per ton-mile.....	.158	.0182	.0001	.108	.103	.0187	.1559	1.0106	1.6039		

No heading in this table requires comment except, perhaps, that of "Overhead." In the past year all employees engaged on a basis of annual compensation have been entitled to 30 days' annual leave and 30 days' sick leave. Therefore, if machinists or helpers were absent from duty with pay, their salaries were charged to the "Overhead." Rent, light, and heat, supervisory officials, watchmen, and miscellaneous labor, as well as expense of maintaining and operating the inspectors' cars, were similarly charged; in other words, any cost that is not specifically chargeable to a particular truck, is thrown into the "Overhead." "Overhead" is distributed over each type of truck on the basis of its capacity.

ACCOMPLISHMENTS.

There were so many problems incident to organizing and operating the fuel yard in 1919, its first year, that all could not be completely disposed of; hence, at the opening of the fiscal year 1920 much remained to be done toward developing the organization and improving its equipment. The year's work may be briefly summarized as follows:

1. The Government fuel yard contracted for and completed the concreting of the surface area of the yard available for storage; constructed eight partitions to provide for the storage of approximately 2,000 tons of different sizes of anthracite coal and such other minor repair work as the painting of buildings and plant and adjustments in machinery.

2. Although the year was marked by numerous industrial disturbances affecting the country's fuel supply no Federal or municipal plant was at any time without fuel. The storage facilities, of course, contributed largely toward this result. The fuel situation since the 1st of November has been such as to demonstrate thoroughly the wisdom of establishing a centralized purchasing organization and of having a storage yard and distributing equipment. It has been particularly advantageous in the year past by reason of the fact that coal has been distributed frequently pursuant to priority orders issued by Government agencies. These agencies were able to deal with one office having control of the fuel needs of the Federal and municipal plants, and this fact has been helpful to them as well as to the railroads. At the same time the many Government officials having direct charge of plants throughout the District were relieved of anxiety as to their fuel requirements.

3. Contracts for fuel needs for the past fiscal year expired on April 30. Since that time fuel has been the sellers' market to such an extent that the yard has been unable to make contracts for the ensuing fiscal year for more than 45,000 tons. Proposals have been solicited

on two occasions from upwards of 150 operators. In one case contracts were awarded for 45,000 tons, in the other not a single bid was received. The needs for April, May, and June have been supplied by contributions, so to speak, through the courtesy of the operators in the Somerset, Central Pennsylvania, and George's Creek districts at the instance of the National Coal Association. The price paid for this coal has been \$4.76 per gross ton at the mine.

4. Provision was made for the handling of the stowage service, at a material saving over the contract price of last year.

5. The machine shop at the garage has been equipped to overhaul completely the motor trucks. Two additional rooms above the garage were rented and equipped for use as a storeroom in which all parts and supplies are kept. The trucks, on the whole, have stood up exceedingly well during the winter, considering that they were forced to haul coal at all times without regard to the conditions of the streets. Practically all of them will have to be overhauled; 13 have already been put into condition.

6. Two bookkeeping machines were purchased for use at the main office for keeping the ledgers and stores accounts. The accounting system was revised to provide detailed analyses of expenditures.

7. The Government fuel yard has performed a real and tangible service in meeting under the trying industrial conditions the coal requirements of the Federal and District Governments. The amount of money saved to the Government is, of course, exceedingly difficult to determine. Various estimates could be made by comparing Government fuel yard prices with prices paid by private consumers, and the Government fuel yard's handling cost with the margin allowed retail coal dealers by the Fuel Administration. Such estimates would show that a material saving has been effected.



DEPARTMENT OF THE INTERIOR

REPORT
OF THE
ST. ELIZABETHS HOSPITAL

TO THE
SECRETARY OF THE INTERIOR

FOR THE
FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

11759—INT 1920—vol 1—45

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Clinical Psychiatrist.

EDWARD J. KEMPF, M. D.

Assistant Clinical Psychiatrists.

EDWARD WM. LAZELL, M. D. ¹	LUCILE DOOLBY, Ph. D.
---------------------------------------	-----------------------

¹ Resigned.

² Died.

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Dental Interne.

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REPORT OF ST. ELIZABETHS HOSPITAL.

WASHINGTON, D. C., *July 1, 1920.*

SIR: The board of visitors for St. Elizabeths Hospital have the honor to submit the sixty-fifth annual report of the hospital, consisting of the report of the superintendent for the fiscal year ended June 30, 1920, and his recommendations.

Respectfully,

WM. C. BRAISTED,
President of the Board of Visitors.

WM. A. WHITE, M. D.,
Superintendent, Secretary of the Board Ex Officio.

REPORT OF THE SUPERINTENDENT.

MOVEMENTS OF POPULATION.

On June 30, 1920, there were remaining in the hospital 3,468 patients, as against 3,586, a decrease of 118 patients as compared with the previous year. The total number of patients treated during the year was 4,628. The number of discharges, including deaths, was 1,160. The daily average population was 3,489, as against 3,638 for the year 1918-19, a decrease of 149.

Movement of population, fiscal year ended June 30, 1920.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Remaining June 30, 1919.....	2,261	460	542	323	3,586
Admitted during year 1919-20.....	641	151	173	77	1,042
Total number under treatment during year ending June 30, 1920.....	2,902	611	715	400	4,628
Discharged:					
Recovered.....	222	29	26	13	290
Improved.....	223	27	18	12	280
Unimproved.....	156	29	30	13	228
Not insane.....	60	1	19	2	82
Died.....	167	45	38	30	280
Total discharged and died.....	828	131	131	70	1,160
Remaining June 30, 1920.....	2,074	480	584	330	3,468

ADMINISTRATIVE DEPARTMENT.

OFFICE OF STEWARD.

FARM AND GARDEN PRODUCTS.

Fruits and vegetables raised during the year ended June 30, 1920.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Apples:			Milk.....gallons	167,513	\$60,304.83
Crab.....bushels	102	\$153.00	Onions, green.....bunches	23,995	737.85
Green.....barrels	305 $\frac{1}{2}$	1,611.10	Oyster plant.....do	1,380	69.00
Beans, lima.....bushels	67 $\frac{1}{2}$	472.50	Parsley.....do	10,865	332.85
Beans, string.....barrels	111 $\frac{1}{2}$	569.65	Parasimpe.....do	62 $\frac{1}{2}$	125.00
Beets.....bunches	5,665	232.97	Pears.....bushels	154	308.00
Cabbage.....barrels	3,116	230.00	Pears, green.....do	53 $\frac{1}{2}$	85.75
Cantaloupes.....single	3,816	331.60	Peppers, green.....do	272 $\frac{1}{2}$	441.30
Carrots.....bunches	27,956	851.68	Plums.....do	4	8.00
Cauliflower.....heads	100	11.50	Pork, fresh.....pounds	32,368	9,707.40
Celery.....bunches	6,765	338.25	Potatoes, sweet.....bushels	280	560.00
Cherries.....quarts	940	188.00	Potatoes, Irish.....pounds	52,737	1,969.51
Chicken.....pounds	540 $\frac{1}{2}$	190.24	Pumpkins.....single	2,040	164.95
Corn, green.....ears	27,572	598.95	Radishes.....bunches	10,244	306.32
Cucumbers.....single	1,934	58.02	Spinach.....barrels	27 $\frac{1}{2}$	34.25
Currants.....quarts	120	24.00	Squash, summer.....single	10,753	537.65
Eggs.....dozen	6,476 $\frac{1}{2}$	3,139.94	Tomatoes, green.....bushels	907 $\frac{1}{2}$	2,266.74
Egg plants.....single	8,360	484.08	Turnips.....do	15	18.75
Figs.....bushels	4 $\frac{1}{2}$	6.12	Watermelons.....single	84	21.00
Grapes.....pounds	15,840	960.40			
Kale.....barrels	221	428.50	Total.....		\$9,318.90
Lettuce.....heads	10,609	580.45			

Forage and feed raised on farm during the year ended June 30, 1920.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Corn:			Hay, green—Continued.		
Ear.....barrels	43 $\frac{1}{2}$	\$435.00	Rye.....tons	25	\$250.00
Shelled.....bushels	165	330.00	Wheat.....do	52	520.00
Corn fodder.....tons	560	5,600.00	Timothy.....do	12	240.00
Hay, green:			Beets for cows.....bushels	36	108.00
Corn.....do	550	5,500.00	Beets for chickens.....do	9	27.00
Cow peas.....do	154	1,540.00	Carrots for chickens.....do	8	16.00
Oats.....do	52	520.00			
Orchard grass and clover, tons	83	1,660.00	Total.....		16,746.00

ARTICLES MANUFACTURED.

Work of sewing and mending rooms during the year ended June 30, 1920.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Aprons:			Cloths:		
Bungalow.....	74	\$150.13	Table, long.....	347	\$2,490.56
Dining room.....	301	111.60	Table, short.....	355	1,914.66
Boys, gingham.....	58	42.48	Coats:		
Porcalle.....	6	2.52	Citizens.....	1,110	2,029.74
White.....	1,040	456.54	Dairy.....	24	20.40
Bags:			Overall.....	1,231	2,425.27
Clothes.....	33	18.79	Surgeons.....	1	.96
Jelly.....	25	7.75	Corner pieces.....	15	1.48
Laundry.....	10	1.50	Covers:		
Sand.....	4	.60	Billiard table.....	3	16.26
Bloomers, denim.....	63	98.28	Bureau.....	283	118.84
Blouses, soldier.....	70	539.20	Car.....	502	350.16
Caps:			Couch B. L.....	1	2.87
Dairy.....	39	6.63	Corset.....	5	1.65
Rubber.....	72	55.44	Cushion B. L.....	13	16.32
Cases, pillow.....	7,746	3,020.94	Piano.....	1	.82
Canvas, bedside.....	66	64.00	Screen.....	854	55.15
Centerpieces.....	126	72.62	Screen silkoline.....	2	1.34
Chemise.....	1,572	1,040.52	Slideboard.....	45	87.90

Work of sewing and mending rooms during the year ended June 30, 1920—Continued.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Covers—Continued.			Pants—Continued.		
Stand.....	1,835	\$1,078.79	Overall.....	1,610	\$2,702.74
Table B. L.....	10	13.62	Soldiers.....	203	725.68
Curtains:			Petticoats.....	1,411	1,110.14
Brown, linen.....	8	20.00	Petticoats, outing flannel.....	3	1.14
Cotton, long.....	5	2.63	Sheets:		
Disrobing.....	4	11.04	Double.....	253	475.64
Holland.....	1,365	914.43	Single.....	12,555	19,004.10
Rubber.....	1	7.46	Shirts:		
Swiss sash.....	55	21.39	C. F.....	2,617	3,700.08
Swiss long.....	16	8.00	Check.....	4,542	6,111.42
Drawers:			Night.....	1,539	1,892.97
Boys' C. F.....	4	2.72	Percale.....	3	2.67
Men's C. F.....	3,215	4,101.10	Skirts:		
Men's, cotton.....	61	57.95	Gingham.....	31	45.88
Women's, cotton.....	973	486.50	Denim.....	9	6.03
Dresses:			Strainers, linen.....	61	48.24
Denim.....	29	86.71	Suits, canvas.....	20	73.56
Gingham.....	1,468	3,547.41	Ticks:		
Night, long.....	593	785.20	Mattress, double.....	10	31.80
Night, short.....	962	919.69	Mattress, single.....	692	1,479.22
Percale.....	996	1,825.92	Pillow.....	615	319.80
Gowns:			Towels:		
Nurses.....	34	56.44	Barnsby.....	1,113	283.55
Surgeons.....	19	20.44	Bath.....	8,480	2,325.15
Mats, drawn.....	55	68.75	Tea.....	3,187	628.80
Pads, table.....	66	267.70	Tubs, canvas, bath.....	11	101.06
Pants:			Underhandkerchiefs.....	1,277	296.11
Boys, gingham.....	1	.46	Waists, percale.....	4	3.80
Citizens.....	1,825	3,209.05	Total.....		74,539.46
Dairy.....	24	20.40			
Outing flannel.....	3	1.14			

REPAIRS AND MISCELLANEOUS WORK.

Articles.	Quantity.	Value.	Articles.	Quantity.	Value.
Aprons, made.....	45	\$2.70	Miscellaneous repair.....	33,585	\$1,343.40
Blankets, hemmed.....	236	9.44	Bed pads.....	216	8.64
Gloves, made.....	137	5.48	Trousers, cleaned.....	186	9.30
Dresses, made.....	4	3.80	Laundry nets made.....	67	2.68
Names, sewed on.....	11,138	35.19	Total.....		1,542.77
Napkins, hemmed.....	2,311	92.44			
Suits, cleaned and pressed.....	99	29.70			

Articles made in the bakery during the year ended June 30, 1920.

Articles.	Quantity.	Value.
Bread.....		
Rolls.....		
Pastry.....		
	loaves.....	1,112,466
	single.....	2,085,288
	pounds.....	69,604
Total.....		81,280.07

Work done in laundry during year ended June 30, 1920.

Articles.	Quantity.	Value.
Number of pieces:		
Washed.....	4,208,065	\$22,714.99
Dried.....	1,658,327	7,712.59
Mangled.....	2,192,135	5,464.32
Ironed.....	357,603	15,068.20
Total.....		50,960.10

Articles made in Howard Hall workroom during the year ended June 30, 1920.

	Quantity.
Brooms.....	3, 110
Brooms, whisk.....	60
Hats, straw.....	276
Stockings, knit.....	1, 212

Articles made in brush shop during year ended June 30, 1920.

Brushes:	
Scrub.....	480
Sweeping.....	180
Dust.....	240
Hair.....	300
Horse.....	24
Kettle.....	6
Crumb.....	24

Work done in mattress shop during year ended June 30, 1920.

Mats:	
Drawn.....	118
Mattresses made and made over:	
Hair, single.....	1, 539
Hair, double.....	18
Straw.....	47
Pillows made and made over:	
Hair.....	1, 077
Feather.....	41
Hair, old, renovated.....	34, 100

Articles made in shoe shop during year ended June 30, 1920.

Shoes, men's.....	175
Shoes repaired.....	1, 877

Canned fruits and vegetables, preserves, jellies, etc., prepared in hospital kitchen during year ended June 30, 1920.

	Quarts.		Quarts.
Apples, canned.....	181	Pears, preserved.....	664
Apple jelly.....	912½	Pears, canned.....	198
Blackberries, canned.....	955	Price apples, canned.....	15
Blackberry jelly.....	22½	Peaches, canned.....	21
Cherries, canned.....	257	Peaches, preserved.....	12
Chili sauce.....	620	Plums, canned.....	40
Currant jelly.....	27½	Pears, pickled.....	58
Catsup (bottles).....	515	Picalille.....	198
Damsons, preserved.....	11	Quince, preserved.....	38
Figs, preserved.....	9	Quince, jelly.....	12
Grape juice (bottles).....	33	Strawberries, canned.....	25
Jelly, grape.....	742	Tomatoes, preserved.....	15
Jam, grape.....	838	Watermelon pickles.....	22
Onions, pickled.....	69	Watermelon, preserved.....	15

Shop and storehouse building.—The new shop and storehouse building being constructed to the north of the Howard Hall building is now progressing very rapidly. The building proper has been completely constructed, all the walls being up, the iron girders in place, and the

roof on. The windows and sashes are now being put in place and the millwork, having been completed, is now being erected by the carpenters. The floors and stairways have been finished. All electric conduits, steam and water pipes are in place ready for outlets. A contract has been let for the installation of a freight elevator, which calls for delivery ready for use within ninety days. The steam and electric tunnel to the shop building extending from Garfield basement has been completed.

Coal-storage.—The rear switch of the coal-storage pocket is now practically completed. All forms are in place, the only delay being the lack of cement on account of the embargo existing at the present time. There remains three sections to be completed, which requires seventy sacks of cement. This is one of the projects that we were compelled temporarily to abandon during the war, on account of the lack of the necessary labor; and, as soon as this is completed, we will then have storage capacity for about 7,000 tons of coal up to the track level of our coal trestle. By piling coal above the track and alongside our siding, we could easily take care of 10,000 tons of coal. This would give us a reserve supply for about six months of the year, ample to take care of all emergencies.

Track scale.—The track scale authorized by Congress has been installed and is now in use. This scale has been located on the offshoot to the left of the track just in front of the fuel sample house. A window has been placed in the approach to the fuel house, and the weight beam located in this entrance. This scale is large enough to take any length and weight car now in use, and has a capacity of 300 tons, and has 50 feet of effective track. We believe this will meet our needs for many years.

Fence.—Additional iron fence purchased has been erected for 200 feet east from Nichols Avenue extending to the ravine on the approach to the hospital from the city. About 800 feet of iron fence has been erected along the eastern boundary of the hospital, extending from Alabama Avenue and Wheeling Road toward the hospital cemetery.

Sewerage.—The hospital has been having trouble on account of the manner in which the old sewer lines were originally laid. The terra-cotta pipe was merely laid in trenches, and the passage of time has permitted tree roots to enter the crevices between the terra cotta and these have continued to grow in such manner that they have completely blocked up the sewers. We have been compelled repeatedly to dig up sewers during the past year for the purpose of cleaning them out. We have found it advisable on these occasions to replace them by new terra-cotta pipe laid in concrete, which would prevent the tree roots from gaining entrance. Among the sewers replaced was that extending from the cow barn and stables across Nichols Avenue to the manhole in front of Hitchcock Hall. Three manholes

have been built at intervals along this line. A new drain was installed in the back areaway of M Building and connected to the main sewer to take away the waste water from the areaway, relieving a very unsanitary condition which caused very disagreeable odors.

Cleaning boilers.—All the boilers at the power plant were cleaned, the tubes rebored and headed up, and the boilers all put in first-class condition. We have had very little trouble with the boilers during the past year, except when we received the bad shipment of coal. The stokers were all gone over thoroughly, overhauled, new parts being installed where needed. The orickwork in the stokers and under the boilers was rebuilt and new bricks installed where needed. The soot-blowing device was given a general overhauling, and we found it desirable to make a few changes which gave us better results.

Locomotive.—The locomotive gave us some trouble during the year. We found it necessary to give it a general overhauling and to replace many of the tubes. This work has been completed, and it is now in good condition.

Railroad.—The railroad track is still giving us a good deal of trouble, being in need of a great many repairs. We are gradually going over this old track, replacing the ties and putting in a heavier rail. The old rail, sixty pounds to the yard, was entirely too light for the heavy cars now in use. We have purchased ninety-pound rails and hope from time to time to replace all of the rails with this heavy size rail. It is desirable, as soon as it is found practicable, to straighten the road; that is, to cut out the compound curve right under the hill on which is located Howard Hall by making a broader and straight curve of this part of the track. This would undoubtedly reduce the number of cars that get off the track each year, and, we believe, will tend to reduce the cost of the hauling of cars.

Water.—All wells were overhauled during the summer and kept in good shape during the past winter, getting the best results ever obtained. Before cleaning these wells, we were in constant danger of water shortage and had to force the machinery to keep up the supply for the use of the hospital. Since cleaning the wells the supply of water has increased so much that we always have an ample supply on hand for the hospital, and the machinery does not have to be driven as hard as before. During the past year the total amount of water pumped from the wells amounted to 198,555,000 gallons. The machinery at the pumping plant was regularly inspected and kept in thorough repair. The shortage of water existing for several years past has been overcome, and not only have we been able to have an ample supply for our own use, but we have been furnishing water to the Army Aviation Camp on Bolling Field and the Naval Aviation

Station on the Anacostia flats. Water has been furnished to the Army and Navy at cost.

The Godding-Croft water supply.—The water supply at Godding-Croft has, as reported, proved insufficient. The new well which was sunk during the past year apparently gave a successful test. A pump, engine, and tanks were purchased and erected over this well. The work of connecting up to the water lines for the different barns houses, etc., will be started just as soon as additional supplies ordered have been received. We believe we will then have an ample supply of water sufficient for all needs, both from a standpoint of fire and for the use of the stock on this farm.

Steam and heat.—Steam was maintained during the past year with a more satisfactory temperature throughout the entire hospital than for several years past. There was no time during this year when there was general complaint on account of cold. There may have been some rooms or some parts of the hospital where there was some complaint, but this was taken up and new radiators installed. New steam pipes were installed in P kitchen and connected to the various steam cooking utensils, in order to replace old pipe which was much worn and giving trouble by leaking. The heating system in the R building was gone over and all necessary repairs made. Both steam and return line connections were made with the Red Cross and Knights of Columbus buildings. The steam mains, valves, and steam traps were overhauled at the power plant and all necessary repairs made. The ash handling system was thoroughly overhauled, new pipe installed in some parts and repairs made where necessary. The boiler feed lines were overhauled and relief valves installed to relieve the excessive pressure on the lines in the event of the boiler feed valves all being closed, thus preventing the possibility of damaged pipe or pump. In the tunnels and basements of buildings, all steam lines were overhauled and repaired, some changes being made to the betterment of the heating system. Pipe, where exposed, was covered during the past year with asbestos.

A start was made on the high pressure steam system, most of the 12-inch pipe having flanges attached, and it is hoped to continue this work during the present season.

Ice and refrigeration.—The ice and refrigeration plant has been in continuous operation during the year. This present plant is very efficient, it only being necessary to run it eight hours each day during the winter months and 16 hours each day during the summer months to obtain an ample output. During the year we manufactured 1,057 tons of ice and approximately 5,000 tons of refrigeration. The temperature of the cold storage room has been well maintained during the year, this plant being ample to give satisfactory results.

Lights.—The work of improving the lighting of the hospital has continued. Chain pulls have been eliminated and tungsten lamps substituted for carbon filament lamps in several of the buildings of the hospital. The Knights of Columbus Building has been wired for lights and electric service installed. An exhaust fan was installed in B douche room to extract moisture from the air and reduce the temperature.

Bakery.—Demands upon the bakery seem to be growing, even more rapidly than improvements through additional machinery that was furnished. During the past year there were baked 1,112,466 loaves of bread weighing 15 ounces each, 2,061,288 rolls, 24,000 buns, and 69,604 pounds of different kinds of pastry. During this period we were able to get several additional bakers who either had former experience at this hospital or in other bakeries and were enabled to turn out this large additional amount of work. The item of additional machinery and storage space is now confronting us. We have ordered additional machinery that will be needed. In order to make bread at the hospital the flour is now poured through a sieve into a mixer which has a capacity of five barrels. From this mixer, where water is added, it is then put into troughs. The present troughs are showing signs of wear and it is necessary to get additional ones. Two steel ones 10 feet long have been ordered. From these troughs the dough is then put in a scaling machine where it is scaled to the proper weight. From the scaling machine it should go through a gyro-baller machine, which shapes it into a ball. The hospital has not such a machine, but has ordered one which will be delivered shortly. The dough from this balling machine is then put into a proofing machine. One of these has been ordered and we hope to have it in use at an early date. From the proofing machine it is then put in a molding machine, one of which we now have on order. From the molding machine it is put into the steam room and after it has reached its proper size it is then put in the oven. The ovens, notwithstanding the hard and continuous use they have received during the present year, are now in first-class condition, and aside from some repairs (the parts have been ordered for this purpose) we believe will be ample for our immediate future use. A new machine has been ordered called a clipper beater, for making cakes. Additional room is required in connection with our bakery for the machinery ordered, and also to carry our supply of flour. As soon as opportunity presents itself, we hope we shall be able to extend our flour room, providing the additional space needed.

Laundry.—The laundry work is increasing very rapidly. The more patients we receive and the more employees needed, the greater is the work of the laundry, but other changes that were made increased the work of this department more than the proportion of work that comes

from additional numbers. Particularly is this true of the building set aside for hospital purposes, which has largely increased the amount of material which must be furnished to this class of patients. The increased dietary furnished, with the better attention paid those patients, furnishing table cloths to each table, naturally increases the supplies that must receive laundering. During the past year the number of pieces laundered were 4,208,065, the number of pieces rough dried were 1,658,327, the number of pieces ironed 357,603, the number of pieces mangled or passed through the flat-work ironer 2,192,135. During this time we were able to wash all the towels used in the Interior Department and do the work for the post laundry of the Army Aviation Field, both at not exceeding cost price. The Civil Service Commission, whose towels were washed heretofore under the supervision of the Interior Department, has requested us to do this work for them, notwithstanding that their appropriation will be carried separately during the year 1921, and we think we shall be able to grant them their wish in this direction. During the year the hospital purchased a tumbler, for the purpose of drying such articles as wool blankets, etc., and this has proved a desirable addition to this plant. This machine not only relieves the drying rooms, but turns out the blankets in an improved condition, and we believe extends their life. The blankets after coming out of the tumbler instead of being hard and dry are as soft as when the blankets were new. We have ordered two large washers of the Cascade type, which will replace four of our old worn-out washers. These washers, having an increased capacity, should expedite the work and have a tendency to decrease the amount of labor needed. A new water heater and storage tank has been purchased and is now being set up for use. This tank and heater will replace the Toby heater which has been used but proved not large enough to heat the amount of water necessary for the laundry work. We believe this additional machinery will have a tendency to help us turn out an increased quantity of work in a more satisfactory condition and in a shorter time.

Cows.—The regular tuberculin test of the hospital herd, including 304 cows, heifers, and calves, was made, and there was no reaction or suspects. This is practically the eleventh successive year in which there were no tubercular suspects, and it shows that the herd is in excellent health. While in previous years there may have been one or two that were doubtful, we have at once destroyed these animals, and a post-mortem examination demonstrated that they were free of any disease. This year there were none that showed symptoms, and it was put on the list of accredited herds by the United States Department of Agriculture as free of tuberculosis, it being one of the largest milk-producing herds on the list. The milk produced during

the past year was 167,513 gallons, or approximately 5,000 gallons less than the previous year. This milk is of a very superior quality, and we feel that it would be difficult if not impossible to secure an adequate quantity of the same class of milk in this vicinity. The herd of cattle is what is known as grade Holsteins. For the past 10 years we have been gradually eliminating all heifers that do not come up to what we consider a good standard. We have purchased several registered Holstein bulls and have used only these for serving our cows. The herd is constantly growing in numbers and value, although an effort is being made to keep only about 200 cows. Milk production has increased from 5,425 pounds per cow a year in 1908, with only 97 cows in the herd, to 7,710 pounds per cow in 1919, with 200 cows in the herd. During the past year the veterinarian, Dr. Turner, returned from military service where he was manager and inspector of the Veterinary Corps of the United States Army, and resumed his duties as attending veterinarian of the hospital. We will probably require one additional bull during the next year, having purchased one during the past year. The heifers at Godding-Croft are healthy.

Several changes should be made in reference to the milk supply. The milk as it leaves the cow barn is of low bacterial count, but we fear contamination may occur before it ultimately reaches the consumer at the hospital. We believe that the entire system of handling milk should be changed, but this can not be done until new high-pressure steam lines are installed and connections and outlets made at the dairy barns. A modern creamery should be installed in connection with these barns and a trained creamery man should have charge of handling the storage and distribution of the milk and the cleanliness of all utensils. The herdsman should devote his entire time to the care of the cows and production of milk. The creamery, such as suggested, would require the following apparatus:

- 1 sanitary milk receptacle and intake pipe.
- 1 clarifier.
- 1 pasteurizer.
- 1 milk cooler with plain refrigerator coils.
- 1 sanitary bottling machine.
- 1 refrigerating machine in cool-storage room.
- 1 steam sterilizer.
- 1 milk-can washer.
- 1 bottle-washing machine.

This scheme contemplates bottling in quart bottles all milk used in the hospital, except that used in cooking. With this system installed, and with the use of our automobiles, milk can be delivered clean and cool three times daily throughout the hospital. All con-

tainers can be properly washed and sterilized at the creamery, and responsibility for cleanliness can be definitely placed.

Silos and feed rooms should be built adjacent to the new barns, the silos to be two 150-ton vitrified block silos to be built on the side of each of the present barns, with a concrete room between the silos and barns to care for the grain, feed, etc. Under present conditions, the grain is stored in the new barns immediately in front of the cows. It keeps the barns disorderly and is a constant menace to the health of the cows, due to the possibility of their getting loose at night and overeating. This has produced sickness in some cases during the past winter, when three of the cows had attacks on account of overeating. In addition to the foregoing, we believe that these should be considered as a labor-saving device, and should have the result of decreasing the amount of help needed.

The manure carriers recently installed in the new barns have materially lessened the heavy, dirty work about the barns, and produced greater cleanliness about the premises. A new driveway from the cow barns to the pasture should be made, this driveway to be a concrete road with proper fence and gates and built from the north end of the barns to the cow yard. The present water trough in the cow yard should be removed to the east side of the cow yard and replaced by modern cement troughs, which would improve present conditions.

Hogs.—In spite of double vaccination, using the best virus and serum obtainable, the hospital lost 45 pigs from cholera between February 27 and March 25 last. All these pigs had received simultaneous treatment against cholera, but evidently the virus was not sufficient, as these pigs died during the period when the effect of the serum alone gave them no further immunity. The Department of Agriculture was called in consultation, and their opinion was that the virus was impotent. The Chief of the Bureau of Animal Industry of the Department of Agriculture very generously furnished 10,000 c. c. of serum and sufficient virus to vaccinate the herd. In this way the disease was controlled. All pigs previously vaccinated will be given simultaneous treatment this fall in order that any outbreaks may be controlled.

The hospital purchased two loads of feeding pigs during the year. The first load of 15 are growing very rapidly, and the last load of 128 seem to be thriving, but feeding has not progressed sufficiently to give definite results. Two additional boars have just been purchased, and we now have quite an improved herd of pigs. During the year the killing of hogs produced 32,358 pounds of fresh pork. We now have on hand 123 hogs and 183 pigs.

Poultry.—During the year the condition of the poultry farm has continued about as heretofore. It produced about 6,476 dozen eggs

and chickens were killed from time to time for use. There are at the present time about 2,383 chickens.

Horses.—The introduction of automobiles has materially decreased the number of horses in use. During the year we lost through being condemned and destroyed, 7 horses, leaving a balance of 54 on hand. Several of these horses are quite old and will have to be disposed of.

Automobiles.—In accordance with an act of Congress, there was transferred from the War Department for our use during the past year five motor ambulances, five $\frac{3}{4}$ -ton trucks, three $1\frac{1}{2}$ -ton trucks, five Hudson passenger vehicles, and two Ford passenger vehicles. These are now in use and will materially assist in expediting the delivery of food and transportation of patients. A pump and gas tank have been purchased, the gas tank having the capacity of 1,000 gallons of gasoline. These have been installed adjacent to the building in which the automobiles are housed, and have proven adequate for our use.

Painting.—We have added several painters to our force and have caught up a good deal with the amount of painting that had accumulated during the war period. Several of the buildings have been painted throughout, and many rooms in other buildings have received several coats of paint. The new iron fence along Nichols Avenue has been repainted.

R building.—R building, of the Richardson group, on the east side of Nichols Avenue, has been renovated and put in commission for general hospital purposes. It is in charge of the internist, and practically all of the patients requiring general hospital care have been transferred there for treatment. Sick employees will also be cared for in this building. The nursing force is under the chief of the training school or director of nurses, and the force of attendants are only those who have had experience in the training school. Dietitians are in charge of the food department in this building, and very good results are being obtained. New hospital and kitchen furniture and utensils have been ordered, and many of these have already been received.

X-ray equipment.—The X-ray outfit which Congress authorized to be transferred from the War Department has been received and is used in connection with the hospital building. This outfit has been set up in B building and several additional appliances have been purchased. We now have an up-to-date X-ray outfit for practical hospital purposes.

Dental equipment.—The dental outfit that was installed in this hospital by the military detail that was on duty here during the war was by authority of Congress transferred to the hospital when they

left the institution. This outfit is now in use and gives the hospital the benefit of a first-class dental equipment.

I building.—The I building of the Richardson group has been transferred from the male to the female service, and is now occupied by the feeble bed patients, formerly located in Toner Building. These patients are either of a chronic invalid class or those suffering from advanced age, and are considered as a semihospital class of patients.

P building.—The first floor of P building in the Richardson group has been vacated by patients and turned over to the Vocational Education Branch of the Public Health Service for the treatment and training of the patients of this institution sent here under the supervision of the Public Health and War Risk Bureaus. It is the purpose of the director of this branch of the work to teach commercial and common school work, also agriculture and industrial work. While this work has only just started, yet from the present outlook it bids fair to have a bright future.

Fire department.—There have been no fires worthy of comment at the institution during the past year. The chief of the hospital fire department makes regular inspection of every part of the institution and sees that it is kept thoroughly clean and that there is no waste or inflammable articles in closets or outside places that might lead to fire. Several officers of the District fire department have made inspections at irregular periods with the representative of the hospital fire department, and commented favorably upon the conditions seen. All hose closets on wards of the old section have been equipped with new base valves. All plugs and fire connections have been kept in first-class working order. The fire escapes, fireproof stairways, basements, attics, and grounds have been kept strictly clean and in good condition. All rubber-lined fire hose has been tested at a pressure of 200 pounds; fire hydrants were tested out by a fire company in the District of Columbia; and all fire extinguishers were tested and recharged. All scenery in Hitchcock Hall was fireproofed and the fireproof curtain is in good working order. Additional hose, fire extinguishers, and other adjuncts to the fire department have been purchased during the year.

Sanitary conditions.—An exhaustive study of the sanitary conditions of the grounds and hospital was made during the past year, particular attention being paid to the sanitary appointments of the various buildings to see what provisions had been made and ways and means for improving the conditions were considered and recommended. This work was performed under the bacteriologist of the hospital. Active work on rat extermination was begun. The first attack was made on the ravines, followed by work on the inside of buildings, then on the tunnels and kitchens, with gratifying results. These experiments are still in progress.

Baler and incinerator.—The hospital has just purchased a baling machine to bale old paper. Arrangements are being made to build a series of concrete bins for storing of rags and reclaimed material, and we hope shortly to get an incinerator to destroy all condemned supplies that have no value.

Burrow's cottage.—The cottage to the north of the old Center Building, formerly occupied by a patient, was fitted up and utilized during the past year to house couples where both parties were employed in the hospital.

Libraries.—Both the medical and circulating libraries of the hospital are well patronized. The medical library suffered to a great extent during the great war and the period following on account of failure to receive magazines from abroad. At the present time the medical library consists of 4,500 books. In the circulating library, we have approximately 11,000 books. The average circulation among the patients and employees at the present time is about 2,000. The work in both libraries has increased materially. It has been found desirable to keep the circulating library open every day and accessible to our patients.

Plumbing.—The plumbing and bathrooms of Home Building, including the piping and showers, were changed and new concrete floors installed in these rooms in order to better arrangements of the shower baths and prevent leaks. The plumbing was remodeled and new closets installed in Oaks B Building, superintendent's kitchen, Retreat Building, Allison A, Oaks A, and in several of the wards. In the various dining rooms of the Dawes Building enameled iron sinks were installed, thus correcting the great evil which made it necessary to bring water from one end of the hall to the other in buckets and pans to be used for washing dishes.

Kitchen supplies. Additional cooking utensils and machinery have been purchased for kitchens, and as far as possible aluminum articles replace the old iron and brass pots and kettles, which have outlived their usefulness. In several of the kitchens coffee and tea urns of aluminum were installed, sanitary racks put in place, and additional equipment acquired wherever it could be used. Canopies or hoods have been put over the ranges in the general, detached, and Toner kitchens. These canopies have ventilating flues which take away any gas, smoke, or steam which may arise from the range, and are also a protection against dust falling on the range. In addition, they give better ventilation and protection to kitchen ceilings and should have a tendency to make conditions around the kitchens more sanitary. Dish washing machines have been purchased and installed in general kitchens and in the Toner employees' dining rooms. A large ice-cream freezer has been purchased for use in general kitchen, and electric ranges and griddles have been purchased for use in several

of the kitchens. When all the supplies ordered have been received, our kitchens will be equipped in a thoroughly up-to-date manner with all the modern accessories practicable for such large kitchens connected with a hospital.

Red Cross Building.—The American Red Cross constructed a recreation building on the hospital reservation. This building has been open several months, and has been the means of adding materially to the comfort and welfare of our patients. From time to time socials and receptions are held at this building, not only for the patients but also for our employees. The representatives of the Red Cross at the hospital assist in the recreations provided for the patients and also in training the patients how to play. The representative of the Red Cross has conducted various games and amusements for the patients, setting up exercises, football, volley ball, tennis, etc. Those who could not actively participate in these amusements stand along the sidelines and enjoy the fun. On pleasant days hundreds of the patients were either at work or on the lawns. The working patients are given benefits of other amusements, such as dances, moving pictures, auto rides, or are taken into town to musicals, concerts, and numerous entertainments. During the past year it was arranged that the various classes of welfare workers who assist in entertaining or looking after our patients should act through the Red Cross representatives, who should be liaison officers between the welfare workers and the hospital. We believe this has resulted in equalizing more generally the benefits to the patients.

Knights of Columbus Building.—In connection with the recreation building erected by the Red Cross, they donated the framework of a temporary building, which we had transported to the hospital and erected for the use of the Knights of Columbus. In this building the Knights of Columbus give our patients the benefit of training in carpentry and other industrial work. Small toys, various classes of implements, and other articles are made at their shop.

Industrial department.—During the past year the difficulty in getting the necessary labor and supplies has interfered to some extent in our efforts to increase the industrial departments of the institution.

Department of occupational therapy.—Since last July, when occupational therapy as a department was instituted in this hospital, material progress has been made. The crafts taught include basketry, knotting (hammocks, etc.), leather work, weaving, toy making, and applied arts, plain sewing, fancy needlework, woodwork, gardening. Under the guidance of the supervisor of this department and her assistants the patients have made very material progress, and an exhibit of the work was sent to Cleveland to the annual meeting of the Medico-Psychological Association, where this hospital was awarded a certificate of merit for the chart forms. Much of the

material supplied for this department has been received from donations from well-wishers of the hospital, seeking to further the interests of the patients, and the patients have received the financial benefits realized from the disposition of the articles made. These articles when made have been disposed of and some of the money used to reimburse the fund, and the profit divided up pro rata among the patients.

Brush shop.—The brush shop, located in the basement under the detached dining hall, has made most of the brushes used in the hospital during the past year. We are now making a select class of brushes. Thus, an order is given by the storekeeper on this department for so many brushes of a particular kind, and these orders are filled in the same manner as they would be on contract.

Mattress shop.—The mattress shop has been moved from the basement under the detached dining hall to the second floor of the old Center Lodge, where the electrical department is at present located. This is a much better place, with more light, and better ventilated. In addition, it removes the great amount of dirt that is sent broadcast when the hair is renovated, from the proximity of the dining room and kitchen. The amount of work done in this department seems to be regularly increasing, due to the increased number of patients and employees at the hospital. We have one paid employee in this department, all the rest of the work, including the making of all mattresses, renovating of hair, and making of mats and rugs, being done by patients.

Upholstering department.—The upholstering department has been moved from the basement under the dining hall to the second floor of the old Center Lodge, adjacent to the mattress shop. In this department not only is all the furniture upholstered that we find necessary, but also the shade and curtain work is looked after. The upholsterer is a general man about work. In addition to looking after the upholstering and curtains, as stated, he also looks after the repairing and regulating of clocks, the cleaning of the chapel, and the cleaning of all rugs and carpets for storage over the summer, and similar odd jobs.

Shoe department.—The manufacture and repair of shoes continued during the past year. The number of shoes made increased from 78 to 175, and 1,877 pairs of shoes were repaired. In addition to that, all the harness work of the hospital was done at this shop. There was a great deal of difficulty in getting leather during the past year, and for this reason the increase was not as large as it otherwise would have been. The hospital has just purchased several thousand pounds of leather, and we hope to materially increase the output of the department during the next year. The work pertaining to shoemaking is somewhat technical, and it is necessary to take time in training patients to manufacture shoes and slippers. The machinery in use

all has to be worked by hand and is of the simplest kind, surrounded with all safeguards to minimize the danger of accident.

Brooms.—We continue to manufacture all the large brooms and whisk brooms used in the hospital. The broom-making department is located in the basement underneath the Howard Hall or criminal building, and all of this work is performed by patients located in this building. The total number of brooms made last year was 3,110, and there were 60 whisk brooms manufactured.

Straw hats.—The manufacture of straw hats made out of the matting that is the outside cover of tea chests is conducted in the basement of Howard Hall by criminal patients. During the past year 276 hats were made. The material costs the hospital nothing, and the labor being that of patients, there was practically no cost to the hospital for these hats, which are used by the patients for field work.

Stockings.—The stocking knitting machine, which was moved to the basement of the criminal building during the past year, was put in active use and 1,212 pair of stockings were made. These stockings appear to be far superior to those purchased, have longer life, and are more comfortable.

Preserves.—The hospital received large quantities of fruit, vegetables, and garden products from our farms, orchards, and gardens during the year, some of which we were able to can and put up as chili sauce, catsup, and grape juice for future use. During this year there were 2,356 quarts of fruit canned, 2,650 quarts of fruits made into jellies and jams, 620 quarts of chili sauce, 515 quarts of catsup, 33 quart bottles of grape juice, 69 quarts of pickled onions, and other supplies of the same nature prepared for future use.

Tailor shop and sewing room.—The tailor shop and sewing room have manufactured practically all the bed linen, wearing apparel, and house supplies used in this institution. We have about a dozen employees and from 40 to 50 patients working in this department, and the work which is turned out has increased very materially.

Automatic telephone.—Additional equipment has been ordered to extend the automatic telephones now in use in the hospital. At the present time we have in use about 20 telephones located in A, B, and C buildings, with one outlet in the electrical department. The switchboard for this installation is located in the basement of A building, where most of the phones are located. The additional outfit ordered is sufficient to wire practically all the buildings of the hospital and give 150 outlets. It is proposed to move the switchboard to the new storehouse and shop building when completed, thus putting it under the active control and supervision of the electrical department, which will be located in this building. This installation should expedite the delivery of messages from wards and minimize the amount of labor on the part of telephone operators.

Heating system.—In connection with the installation of the high pressure steam line some plan should be outlined in reference to changing the heating system of the hospital. It would seem that the vacuum system of using exhaust steam would prove most economical and effective. There is quite a large amount of exhaust steam that is now wasted by being thrown into the air, which we believe would be sufficient to heat all of our buildings. This would prove a material saving in fuel and should be worth consideration as a program to be followed. To thoroughly install a vacuum system throughout the institution would require a tremendous appropriation of approximately \$350,000 or \$400,000. We do not believe it is practical to ask for such an appropriation at the present time, nor could we utilize it if it were authorized for immediate installation. We believe that the best interests of the hospital would be conserved by making this change gradually, one or more buildings each year, thus extending the cost over a number of years and minimizing the inconvenience to the patients of the hospital by not making a radical change, which might catch us in the midst of winter, unprepared.

Electric fans.—When the hospital changed from the direct current to the alternating current, many hundreds of electric fans that were installed had to be discarded and disposed of as old brass. To purchase a sufficient number of fans for the various wards and buildings would probably cost from \$10,000 to \$12,000 and require a special appropriation. This may not be feasible at the present time, but the hospital had transferred from the General Supply Committee about 100 fans, such as the Supply Committee had on hand from the War Department, and they are being tested out now to see whether they might be used in this hospital. It is possible that in this manner we might get in some fans each year and thus gradually equip the whole hospital.

Steam and electric meters.—The steam meters installed by the Republic Flow Meter Co. have never given satisfaction and the results obtained are very unreliable. It has been impossible to get the proper figures to be used in connection with the cost keeping, and it is largely a matter of guesswork. Congress in the last sundry civil bill directed that each head of a department prepare a statement showing the total number of square feet of floor space in all Government owned buildings in the District of Columbia, the cost of maintenance and upkeep, including cleaning, lighting, and heating of these buildings; and it is very desirable, even absolutely necessary, to have accurate figures before this information can be furnished. New steam and electric meters have been ordered, and as soon as they are installed we will be in better position to furnish records in reference to the cost and consumption of steam, heat, and electricity.

Roads.—During the past year Congress appropriated \$5,000 for the repair and upkeep of the present roads, and for the construction of such new roads around the hospital grounds as is found necessary. This appropriation was made under the heading of "Roads, walks, and grading." The amount authorized under this head was inadequate and out of all proportion to our needs. The amount of roads and walks at the hospital has increased each year, while the appropriation has remained stationary for many years. The cost of labor and materials has practically doubled. The result is that the roads of this hospital are in a bad state of repair and need a thorough overhauling, repaving, and regrading. It was thought desirable when we last appeared before the Appropriations Committee of Congress to call the attention of the Appropriations Committee to the advisability of doing away with this special appropriation and authorizing that this work be merged with the appropriation for "Buildings, grounds, general repairs and improvements," making both appropriations more elastic and more easily applicable to our immediate needs. Congress saw the wisdom of our recommendation and changed the appropriations, doing away with the appropriation for "Roadways, walks, and grading," and adding an additional amount to their appropriation for "General repairs and improvements to buildings and grounds," also by adding the words "to buildings and grounds" after the words "general repairs and improvements." As soon as we are able to get the necessary supplies, it is proposed to go over all our roads and walks that at present need repairing, in an attempt to improve their condition.

The space in the rear of the semipermanent buildings has been regraded and additional roads and walks laid around these buildings.

Dental department.—The transfer of the dental equipment from the War Department to the hospital, as mentioned before, gives the hospital a much larger outfit and puts us in a position to do more and better work for our patients. The staff has been increased until now we have one resident assistant physician who assists the resident physician, and a dental interne, in addition to the visiting dentist who makes periodical calls for the purpose of consulting and advising on the various cases presented. In connection with this work more attention is paid to the teeth; the X-ray outfit is used in this connection, doing better work. In further extending the treatment of teeth, under the supervision of the nurses more attention is paid to the furnishing of toothbrushes and their care. Cabinets have been made and mugs furnished in which these brushes are kept, and with the cooperation of the nurses the teeth of our patients should improve.

Garage.—In the last sundry civil appropriation bill Congress appropriated \$15,000 for the construction of a garage. Plans have

been drawn covering the class of garage desired, and it is proposed to have this work done by the hospital force, assisted by the patients. It is suggested that this garage be located upon the reservation on the east side of Nichols Avenue, approximately 13 feet from the fence line and 26 feet north of the center of the road leading to the stable. This garage will be about 165 feet long and about 60 feet wide, to be constructed of cement with metal window sashes and concrete floor. The roof will have a center line of ventilation and light. In the east end of this building it is proposed to locate a repair room, with a storeroom on one end and a workmen's pit on the other. The entrance to this repair shop is to be through 12-foot doors, and a similar door will be located on the outside of the building so that the machines may pass all the way through without reentering the garage proper. On the center front of this garage there will be a small office with entrances or exits on each side of the office proper. All chauffeurs and employees must report to the employee in charge before entering or leaving the garage. Proper records will be kept of the use of all machines, including any accidents or incidents worthy of note. The gas tank will be located just outside of this office, with a pump within and a hose extending out through the window for use in filling the machines' tanks. We hope to enter upon this construction as soon as we can secure the necessary material, in order to prosecute its building at as early a date as practicable.

Hydrotherapy.—Congress included in the last sundry civil appropriations bill the sum of \$15,000 to be used for hydrotherapy treatment and continuous baths to be installed in the various services of the hospital. As soon as arrangements can be made, it is proposed to send out proposals inviting bids for the furnishing of this material, so that it may be installed in the buildings where it is most needed. We believe this additional apparatus will add to the comfort of the patients and be of material assistance in their treatment.

Sun parlor.—Congress authorized an appropriation of \$20,000 to be used in building a sun parlor. This money will be used to build a sun parlor on the front of what is known as the Retreat wards. It is proposed to tear out the front of this building, extending two floors and building an addition inclosed by glass and fireproof, where the patients confined in these wards may get the benefit of open air when possible and the sun where practicable, and at the same time be permitted to smoke and have additional freedom.

Roofs.—For several years it has been absolutely impossible for the hospital to get competent workmen to make the necessary repairs on the roofs of the hospital. It required our utmost endeavors to be able to keep the roofs in such repair that they did not leak. We

hope during the next year that additional sheet metal workers may be secured. As soon as an additional class of these employees is secured, we must go over our various roofs, replace many of them, renovate and reconstruct others, and put them in a state of repair that will avoid leaks and accidents that might result in damage.

Supplies.—The difficulties which we have encountered for several years past with reference to securing supplies have not let up materially during the past year. The markets were so uncertain when the General Supply Committee was considering the awards that they declined to take the risk of putting in bids, or if they did the prices quoted were so high that in many cases they were refused. Some of the vendors who accepted contracts afterwards made attempts to have them set aside, due to the fact that, as they claimed, it was so difficult to get supplies that they could not carry out their part of the contract, or prices had changed to such an extent that it would mean bankruptcy to them to furnish supplies to the Government at the prices at which they accepted. Under date of December 3, 1918, there was an executive order issued that all executive departments and other officers responsible in the expending of appropriations should, so far as possible, purchase materials, supplies, and equipment when needed and funds are available, from other services of the Government possessing materials, supplies, and equipment no longer required because of the cessation of war activities. Following this executive order, Congress enacted it into law through means of several appropriation acts going into effect the same way. The first item of this sort was included in the deficiency bill approved February 25, 1919, and several items were included in the legislative, executive, and judicial bill approved March 1, 1919, and the sundry civil appropriations bill approved July 19, 1919. This same act has since been included in other bills. Naturally, this has delayed to some extent the securing of supplies, the procedure at present being as soon as we find it necessary to secure supplies to ask the General Supply Committee for such supplies as are available as surplus from other departments or bureaus. If we receive information that such supplies are not available, we must then examine the General Supply Committee's schedule to see if a contract has been entered into by this committee for what is needed. If we do not find on that list what is needed, but something similar, and the similar item will not answer our requirements, we will then explain why the item under contract will not meet our requirements and ask authority to go outside the schedule of supplies and make a separate contract in order to supply our needs. If our explanation should meet with the approval of the officer of the General Supply Committee and authority is given, we can then go out into the open market and ask for bids on what we need and buy from the lowest

bidder that will meet our requirements. Should the supply we require be on the general supply list, we then place an order with the contractor; and it has been our experience in past years in many cases that we meet with unusual delays due to the fact, as explained, that it is difficult to get supplies, that transportation facilities are so inadequate that they can not get deliveries, or something else has occurred that was unforeseen, in some cases strikes or threatened strikes, lack of productiveness, or what not. Thus we have had one obstacle after another placed in our way of getting supplies, and from what we understand this has been the general situation, not only with this hospital but with many of the Government bureaus.

Food.—Under the article food supplies, the single item standing out as most difficult to secure in adequate quantities has been that of sugar. An award was made by the General Supply Committee for a whole year. There has been a continual strain in an attempt to get an adequate supply of sugar. We have lived, as it were, from day to day, many days not having a sufficient supply on hand to last over the next morning. We have been continually in the position of contemplating buying on the open market unless there was an improvement in the supply of sugar. Some sugar has been purchased from the War Department, some from the Navy, and several thousand pounds on the open market. The quantities furnished have been decreased until only sufficient to meet our most urgent needs.

There have been other items of food that we have been short of from time to time, but not sufficiently to interfere with the patients' dietary. By means of substituting when a shortage existed, we have been able at all times to furnish a simple diet sufficient to cover the needs of our patients. The necessity of substituting other classes of flour for white does not exist, and the opportunity of again supplying our patients and employees with a satisfactory bread has overcome many causes of complaint which heretofore existed. Our meat supply is ample at all times, and we believe, satisfactory. We have been able to get additional classes of fresh vegetables and in larger quantities. More fruit has been purchased and several additional varieties of sea food added to the dietary.

Other supplies—Soap.—During the first portion of the year we had a great deal of difficulty in securing soap. The bidder who was awarded the contract under the general schedule of supplies refused to abide by his contract and claimed that it was void. Later on he accepted the contract and furnished soap on his award, but there was no time during the year when we had more than barely sufficient to cover our immediate needs.

Hardware.—A similar condition existed in reference to other items. This might be particularly stated in reference to bolts, screws, nuts, and many items of hardware supplies.

Fuel.—The semibituminous coal received during the past year was of a higher grade than for the several years preceding. For this reason less coal was required and not nearly as much trouble was encountered in keeping our boilers in shape. As we have stated in another part of this report, we had little or no trouble keeping the institution properly heated during the winter, notwithstanding the fact that this winter was materially colder than the preceding one. The wear and tear on the grates was much less. The coal we received cost materially more per ton than the preceding year. When comparison is made of the price formerly paid for this class of coal—from \$2.80 to \$3.15 delivered at the hospital—with the price paid during June, from \$7 to \$7.13, and it is realized that the class of coal we are now receiving is, if anything, inferior to that formerly received, it can be appreciated how the cost of living has increased. Anthracite coal that we formerly paid from \$5 to \$6 a ton for, delivered on the hospital switch, now costs \$10.13 a ton. We have on hand at the present time sufficient anthracite coal to last us the best part of next winter. We have on hand only about 2,000 tons of semibituminous coal. We believe this is about the smallest quantity of this kind of coal the hospital has had on hand during the month of July for many years. It has been our practice, as far as possible, to load up on this class of coal during the spring and summer months, and, as soon as we have received an adequate supply, to let off our engineer and have our locomotive and track overhauled. It will be impossible to do that this year, inasmuch as we have to be in a position to continually add to our supply when we can receive it. We have requested the officers of the fuel yard branch of the Bureau of Mines, through whom we must receive our coal, to increase shipments if possible, and have notified them that we are in a position to take any quantity that they should supply us up to and including 10,000 tons, for storage purposes.

Laboratory and scientific department supplies.—The reorganization of our scientific department and additional members of the staff added to this department require materially increased quantities of supplies for laboratory use. During the past year we have spent approximately \$10,000 for buying additional equipment and supplies for the scientific department, including laboratory. This hospital, when all the supplies ordered are received, will have a thoroughly equipped and complete set of laboratories, and be in position to do all work that is demanded. If a new laboratory were built with sufficient room to provide a chemical laboratory and the hospital

could then employ additional chemists, it would require additional equipment for this portion of the laboratory.

Occupational therapy—Supplies.—The installation of the department of occupational therapy and reconstruction work has necessitated the purchase of large quantities of supplies by these departments. Upon the first installation, many supplies, including looms and other equipment, were donated or money provided to pay for what was purchased. But these supplies and equipment were found to be inadequate to meet our demands, and the hospital was obliged to purchase additional quantities in order to supply the patients with work and with the necessary implements and machines to complete their training.

Other supplies.—Many other supplies, both of a temporary and permanent character, have been purchased, such as an electric cutting machine for use in the tailor shop, whereby many garments may be cut instead of by the use of tailor's shears in the old way; furniture and carpets for use throughout the institution; sterilizers and utensils for use in operating rooms; new metal tops for several of the dining rooms; boilers for the greenhouses; automobile repairs; additional equipment for the wheelwright, carpenters, farms, landscape gardener, and florist.

Dietitians.—In an attempt to improve the food, several hospital dietitians have been employed, who have active charge of two of the kitchens and will look after the preparation and serving of food. One of these dietitians is in charge of the food in what is known as the hospital building (R building), and one in charge of the semipermanent kitchen. This should have the tendency to improve the food, to see that the patients receive a well-balanced ration, and to suggest such substitutes as relieve the tendency to furnish the same article too often and too many successive days. We are not in a position as yet to see to what extent our diet will be improved, but look for good results.

Lawns and grounds.—The portion of the lawns and grounds that have been turned over to the farm for cultivation and the raising of truck garden products were given back to the landscape gardener during the year and made over into lawns. This materially improves the appearance of the grounds and no doubt adds to the comfort of the patients. During the war period, these lawns received the benefit of intensified cultivation and a large addition to the hospital larder resulted—such articles as peas, potatoes, kale, spinach, and other items of supply were raised in large quantities. It was during the time that it was almost impossible to buy food in the quantities needed, and it probably meant either to raise them under the conditions that the hospital did raise them, or to go without them and decrease the food supply of the hospital. It was for this reason that we thought it to the best interests of the patients and the hospital,

and, above all, of the country, that we do everything possible to increase the food output of this institution. Not only were the lawns looked after and improved, but the output of flowers and plants increased materially. During the past year cut flowers were again supplied to all wards, particularly sick wards, and plants sent out as far as possible to all wards to improve their appearance. Flower pots were placed in various parts of the institution and grounds, and this lends color and brightness to the surroundings. In the vineyard and orchard, under the supervision of this department, many thousands of pounds of grapes, hundreds of bushels of pears and apples, and many quarts of cherries, currants, and figs were grown. These proved a desirable addition to the hospital diet.

Hitchcock Hall.—Hitchcock Hall continued to be used as a means of entertainment for the patients. Several nights each week in this hall we have moving pictures, dances, or other means of entertainment, either directly under the hospital auspices or under the direction of representatives from the Red Cross or other welfare workers. On many of these trips or entertainments patients are served with ice cream, lemonade, or other accessories which adds to their happiness and contentment.

Hospital personnel.—At the beginning of the year the hospital was still confronted with the great difficulty, due primarily to the war in which this country was involved, of getting a sufficient number of competent employees. During July, 1919, the great shortage of help in the ward service was relieved to some extent by a detail of ward employees from the Army and Navy. These men continued in the hospital until about August 15, 1919. The hospital had inserted advertisements in papers in various parts of the country for male and female help, outlining the advantages in becoming connected with this hospital, the salaries paid, showing the installation of an eight-hour day, the possibilities through the training school, and the location adjacent to the capital of the nation; and in that way we were enabled to get a fairly full quota of employees. The nursing force was placed upon an eight-hour basis, consisting of three sets of employees, each putting in their turn of eight hours, together with the fourth set consisting of graduate nurses whose time is so arranged that they dovetail and cover the periods during which the two changes of nurses on the day period take place. This change seems to have improved the conditions of the employees, made them more satisfied, and seemed to become an incentive to attract a better class of employees. The hospital has materially raised the salaries of employees, so that where about three years ago the entrance wage of female employees was \$15 per month and maintenance and the male employees \$20 per month and maintenance, both are placed on the

same basis; that is, both receive the same entrance salary of \$40 per month plus a \$20 bonus as authorized by Congress, in addition to their maintenance. The increased number of employees required in order to put the hospital on an eight-hour basis made it absolutely impossible, with the limited facilities at hand, to provide them with quarters. The alternate payroll was instituted, giving an allowance to all employees to whom it was desirable but impractical or impossible to furnish quarters. This shortening of hours and increase of salaries, as stated, seemed to have a tendency to attract a higher class of employees. It is the aim to attract a class of employees that has higher educational experience and will be better enabled to fit themselves for our work through the training school for nurses attached to this institution. If the qualifications can be raised to a proper standard, we hope at that time that it may be arranged to so extend our course of training that they will be eligible for registering as graduate nurses in the District and in other States, in the same manner as the nurses from the general training schools.

The basement of Hitchcock Hall was opened in January, 1920, and fitted up as a library and lounge for the employees. A chaperon was chosen from among their number, and it was well patronized until it closed for the hot weather.

In connection with the better treatment of patients, we are now adding to the class of employees used as nurses, a limited number of nurses graduated from the general nurses' training school. It is proposed, if these nurses have not already graduated from the psychiatric school, to have them take our training, and when their education is completed one of each of these is to be placed in charge of each service of the hospital, and one put on night duty, and they are to be held responsible for the general care of the patients, as far as the actual need of nursing is concerned.

The enlarged appropriation, as authorized by Congress, permitted us to increase the number of the medical staff and add additional classes in order to get better facilities for the treatment of our patients. During the reorganization of the staff we were not only enabled to fill several vacancies that existed—as first assistant physician, clinical director, senior assistant physicians, assistant physicians, junior assistant physicians, and medical interns—but also to add new classes to the staff, such as internist, psychiatrist, neuropathologist, bacteriologist, resident dentist and assistant dentist, and also to provide these officers with adequate assistants such as laboratory technicians of the various kinds. Additional positions created, some of which have been filled, are that of superintendent of occupational therapy aids, social service workers, dietitians, and automobile mechanics.

Deputy disbursing agent.—In the last sundry civil appropriation act Congress authorized the creation of the position of deputy disbursing agent of the hospital. This position has just been filled by the promotion of a financial clerk, one of our faithful employees who has long been assistant to the disbursing officer of the hospital. The appointment of this employee will put us in the position of being able at all times to have an employee on hand legally competent to sign checks at any and all times during office hours. This is a great change from the period previous to 1909, when the superintendent was compelled, in addition to his other duties, to act as disbursing agent for the institution and thus sign all checks, as administrative head, and also was compelled to approve all vouchers paying for supplies; while now we not only have an administrative assistant who may alternate with the superintendent for the approval of vouchers, but we also have a separate disbursing agent and a deputy disbursing agent, who are authorized to pay claims as they may arise.

Financial office.—The need for this additional employee in the financial office may be realized to some extent when we compare the amount of work done in the financial office in 1905 to that of the past fiscal year. . The appropriation for the fiscal year ending June 30, 1905, was \$296,120, and the amount of payments made by the disbursing agent amounted to \$729,907.02. During the fiscal year ending June 30, 1920, Congress made an appropriation of \$1,000,000 for the support and maintenance of the patients in the hospital. During the last year the vouchers paid numbered approximately 3,300. Of this there was paid for the hospital support and buildings and grounds \$2,307,345.15; for patients' personal and pension trust funds there was paid \$178,704.66. There was received on account of personal and pension trust funds for the benefit of patients \$298,338.30. The number of vouchers involved does not in any way tell the full story of the increase of work. The pay roll, which included about 500 employees 10 years ago, now numbers over 1,100. While formerly 39 or 40 separate numbers were used to show the number of vouchers that passed through the office, now payment is made twice each month to these employees, and the total pay roll is all included in one number of voucher. The payment of employees twice each month increases materially the amount of work that falls on this particular office. Not only is settlement made twice each month, but instead of paying about the second or third of the month, payment is now made on the middle day of the month and the last day of the month, in order to give our employees the benefit of the money they have earned, and be in accord with the practices of other branches of the Government. To assist in getting out the pay rolls on time, the hospital purchased an addressograph and graphotype machine, this

same machine being used in making out the monthly board bill on account of the board of the indigent patients of the District of Columbia.

Number of employees.—Some indication of the increase in the number of employees during the past year might be appreciated by showing that the number of employees on our pay roll July 1, 1919, was 763; appointments during the year were 1,043, separations during the year were 674. The number of employees on the pay roll June 30, 1920, was 1,132; the vacancies existing June 30, 1920, were 23—this includes 6 vacancies on the medical staff, 9 vacancies on the ward service (including 5 vacancies on the ward service occurring through the new position created as psychiatric nurse), 5 vacancies in the dairy department, and 3 vacancies in the kitchen department.

Office work.—The increased number of employees and patients naturally resulted in an increased amount of paper and office work. This intensified a condition that already existed of overcrowded offices. The chief clerk and stenographer's office is so crowded that it is impossible to find desk room for the various stenographers absolutely necessary to the proper output of the work of this institution. Desks have been placed in several rooms adjacent to the chief clerk's office, but even that has not given us the room required. The financial office is crowded; the bookkeeper's office is badly crowded and the administrative assistant, who has a desk in this office, finds it almost impossible to conduct the work of his office and interview visitors on official business in a manner satisfactory to himself and to get out satisfactory results for the institution. The first assistant physician has moved his desk into the conference room, where is also located one of the stenographers. The senior assistant physicians' office is crowded and the office formerly occupied by the junior assistant physicians, which now includes the Army, Navy, and Public Health liaison officers, is also very crowded. The female physicians' office is so crowded that the clinical director for this service is compelled to find desk room in the room assigned to the matron. The record and file room has long been overcrowded and additional shelf space has been taken in the room occupied by the telephone operator and switchboard. The work of these offices to-day is practically current and up to date, but in the crowded conditions described it is very difficult to get out the work as it should be. It is contemplated to move the civil service and personnel office to the Center Building. This has been put off from time to time due to the necessity of consulting the records daily on account of the new retirement law which has just been enacted by Congress. Some steps will have to be taken in the near future to provide additional room, first for the records and next for the employees.

Retirement law.—At the last session of Congress there was enacted into law what is known as the Government employees retirement law. The hospital has on its rolls about 28 who were subject to the retirement law. About eight of these desired permission to take advantage of this law and made out application for annuity. The balance of those eligible for retirement were of a class that we decided were worthy of continuance in our service, who possess special qualifications which would make it difficult to replace them, and we requested authority to continue them in our service for a period of two years longer.

Future work.—The future work of the hospital may be divided into two classes: First, that which may be performed without special appropriation; and, second, those large and new undertakings which will require specific legislation before this work may be done.

Matron's quarters.—Among the work that the hospital may and can do without specific appropriation is that of remodeling the old Center Lodge and laundry quarters into a matron's or industrial department. It is proposed, as soon as the new shop building is completed, to clear out these buildings by transferring the electrical and sheet-metal workers department to the new shop and storehouse building and then to remodel the laundry buildings. We have moved into the second floor of this building the mattress and upholstering department and use a part of it for storing dry goods. As soon as the shops are moved out of the balance of these buildings, the old interior should be torn out and reconstructed. Linen rooms should be built therein, in which all bed linen, table linen, and similar laundry as received at the laundry should be checked by a representative from the matron's department and replaced by the same number of new items. In this manner, there should be no shortage at any time on the wards for lack of material. We will then not have to wait until the sheets are laundered before they are turned back to the wards. There can be no complaint of shortages due to loss or destruction in the laundry; when the wards send 20 sheets or towels to the laundry, they get 20 new ones from the matron's department. The laundry will then be responsible to the matron for the full number, and names being washed off or torn would not affect the number, as these sheets or towels would have to be accounted for irrespective of where or from whom they were received. The interchange of these materials would have to be under two major classes: First, patients' and employees'; and, second, general linen and those received from hospital or isolation buildings. Other departments which will probably be moved into this building will be the sewing rooms, tailor shop, and the dry goods and men's wearing apparel storeroom.

Roofs on power house.—The roof on the new power house is leaking badly, and examination shows it to be badly in need of repair. A

survey has been made by the hospital's superintendent of the construction and sheet-metal workers, and it has been decided that it would be cheaper, easier, and that better results could be obtained by putting an entire new roof on this building rather than attempting to repair the old one. Material is now being ordered, and as soon as cement is received it is proposed at once to begin putting a new roof on this building.

High-pressure steam line.—At the present time the hospital has but one steam line throughout the institution, the same pipes being used to convey steam during the summer and winter periods. At times it is necessary in certain buildings to carry as high a pressure in summer, when steam is only needed for use in kitchens and hot water, as during the winter when it is used for heating purposes. Of course the amount of steam used does not require as much pressure. Under these conditions it is very difficult to make repairs, unusual leaks result, and this manner of using steam is very costly. It is proposed at a very early date to install an auxiliary steam high-pressure line, and in this way, while one line is being used in summer, primarily for kitchen and hot-water purposes, the other line may be repaired. It is proposed, while installing this auxiliary line, to extend it to take in some of the outlying buildings, such as the stables, dairy, and cow barns (leaving an outlet for the garage), the greenhouses, and Burrow's cottage. In this manner we can also do away with these various auxiliary or subsidiary heating outfits, thus reducing the quantity of fuel used and the possibility of danger from fire.

High-pressure water system.—In installing the high-pressure water system for fire protection outlets were made in order to permit the use of fire hose on all buildings of this institution. Since this installation various additional buildings have been built, including the semipermanent group, Red Cross, and Knights of Columbus buildings. Adequate facilities are adjacent to the Red Cross and Knights of Columbus buildings without additions being made. Arrangements should be made for extending this high-pressure system in order to furnish protection to the group known as the semipermanent buildings. This group consists of seven ward buildings, one of which is used for occupational therapy, one dining room, and one kitchen. It would require not over 400 feet of pipe and either two or three fire plugs. It is proposed to order these supplies at once and enter upon this construction.

Extension of bakery.—In another part of this report we spoke of the additional machinery required in order that the bakery might furnish bread, rolls, and pastry as required for the increased population at the hospital. This additional machinery will add to the overcrowded condition existing in the bakery at the present time. The additional room taken will reduce the available space for storing flour. Our

storage space has always been too small. Any of the space utilized for other purposes would naturally be a disadvantage. It is proposed to extend this building at as early a date as practicable, doubling our storage space and giving the bakery some additional room.

Appropriations—Support.—During the fiscal year of 1920, Congress appropriated \$1,000,000 for the support and maintenance of the patients in this hospital. This included not only the medical treatment of an average of 3,489 patients, but also the feeding and housing of these patients, the salaries necessary to employ a staff of nurses, physicians, and the other employees absolutely essential for the program of the institution, the maintenance for those employees living at the hospital and the general upkeep of buildings and grounds. During this year the personnel of the hospital staff was reorganized, the nurses staff being placed on an eight-hour basis, several additions were made to the medical staff, and the alternate pay roll put into effect making allowances to certain employees who could not be furnished quarters upon the hospital reservation. The number of employees which the hospital was short on account of war conditions, we have been able to obtain on account of the increased salaries paid and the reduction in the number of hours. In this manner the pay roll of the institution was materially increased over that formerly in effect. As stated, the average daily number of patients at the hospital during the past year was 3,489. This is a decrease from the preceding year of 149. During the preceding year the population was very active, there being 1,802 admissions and 1,591 discharged, including 1,090 transferred to other institutions and to their homes. Instead of transferring large numbers to other institutions, we are now receiving by transfer from Army, Navy, and Public Health hospitals additional numbers, which will add to our population. During the last year the total number of admissions was 1,042, a reduction from the preceding year of 760. The total number of discharges from all sources was 1,160, or 118 more than the admissions; notwithstanding all these changes the decrease in the average number of patients treated during the year was only 149. This shows that the population is becoming more stable.

On the other hand, we have just received an intimation that the Public Health Service is about to close one of its hospitals and send its inmates, numbering about 200, to this hospital. We believe it is fair, then, to look forward to a large increase in population during the fiscal year ending June 30, 1922. With the same number of patients to be taken care of, the number of employees must be maintained at its present level. If there are additional numbers to be taken care of, we will have to have more employees, especially nurses and physicians. As stated, the revised pay roll was not in effect for the full year ending June 30, 1920, when the \$1,000,000 appropriation

was authorized, but it will be in full effect for the future fiscal year. Therefore, the amount needed from this appropriation will be larger than for the past fiscal year. While there may be some reduction in the cost of food and medical supplies, yet the condition of labor is such that we can not look for any material reduction from this source. The principal items in use in this hospital are fuel, meats, flour, sugar, and other food supplies. The cost of fuel has more than doubled over what it was three years ago: This hospital used about 20,000 tons of semibituminous coal and over 1,000 tons of anthracite coal. These two items alone would cost us approximately \$165,000 a year, based on the present price of coal. We use approximately 1,200,000 pounds of meat products at an average of 20 cents per pound for all classes, and we believe this is a very low estimate. This would mean \$240,000 for meats. We use approximately 300,000 pounds of sugar each year, for which we are at present paying 24 cents a pound. This might be reduced somewhat, but at an average if 20 cents a pound, it would mean \$60,000 for sugar alone. We must consider that in addition to food and medical treatment, we also must provide clothes, bed wear, tableware, furniture, floor covering, surgical and scientific supplies and that the cost of these has increased in proportion to the articles mentioned. An estimate of what supplies will cost during 1922 must be in the nature of a pure guess. The number of patients we will have to look after can only be approximated, but based upon past and present experience, I believe it is safe to say that we will need at least as much as we used during the past fiscal year. For that reason I think we should ask for \$1,000,000 for support, clothing, and treatment of the Federal patients.

Bulletins.—We believe authority should be extended to authorize this hospital to publish bulletins containing the results of the researches in the scientific departments of the hospital.

Commissary privileges.—It is suggested that an item be included within the appropriation bill authorizing officers and employees of this hospital to purchase quartermaster supplies from the Army, Navy, and Marine Corps at the same price as is charged officers of the Army, Navy, Marine Corps, and the Public Health Service. This suggestion is made in the interest of the Government service, inasmuch as at the present time the hospital has an alternate pay roll and pays additional allowance to such officers and employees as it can not furnish quarters on the hospital reservation. This allowance at the present is very low, and there is some complaint made that it is impossible to get maintenance for the sum allowed. We believe if the authority requested were granted, the employees could make purchases at a smaller sum than they could under present conditions, and this might prevent the necessity of their asking for an increased allowance.

Repairs and improvements.—We recommend that the appropriation requested for repairs and improvement of buildings and grounds be increased from \$80,000, as appropriated for the fiscal year ending June, 1921, to \$100,000. During the fiscal year 1920 there was \$60,000 appropriated for repairs and improvements and \$5,000 for roadways, walks, and gradings. These two appropriations have been changed by Congress to a single appropriation for repairs and improvements for buildings and grounds, and raised from \$60,000 plus \$5,000 to \$80,000. The cost of all material and labor, as has been repeatedly stated, has increased out of all proportion during the last few years, to the appropriations. The work to be done has also increased. It has been almost impossible to get the proper amount of labor or materials. The condition of the roofs of all the buildings and of all the roads is very bad, and it is necessary to make repairs and improvements at once. The valuation of the buildings of this hospital is approximately \$5,000,000. At a fair rate for the cost of repairs and improvements, we would make an estimate of about 2 per cent. At the rate of 2 per cent on \$5,000,000, it would require \$100,000 to keep the various buildings of this hospital in repair. This does not take into consideration the increased cost of labor and supplies, or an additional allowance for walks and gradings. We think, therefore, that \$100,000 is a very low estimate, and that the best results can be obtained if we receive this amount.

Laboratories.—An appropriation of \$100,000 should be requested in order to house our scientific department and its laboratories. The hospital at the present time is using the building known as the Rest Building, containing the morgue and autopsy room, for its main laboratory room. This building is very inadequate, out of repair, and should be replaced. Additional parts of the laboratory, or the research department, are located in various buildings throughout the institution. The pathological laboratory is in one building, the dental laboratory is another building, the X-ray outfit and laboratory in another building, the hospital in another building, and the operating room in still another building. Provision should be made for a laboratory building, as stated, adjacent to the various hospital buildings and the building containing the operating room. We believe that this would result in getting better therapy for the patients, achieving greater good for the Government in looking after the best interests of the people as a whole. We suggest that an appropriation of \$100,000 be made for this purpose. Preliminary plans have been drawn showing the kind of building that we desire and the approximate equipment. We believe this could be secured for the amount named.

Gate houses.—The hospital should be provided with new gate houses, one to be located at the south of the second gate on the

east side of Nichols Avenue and one to be located at the entrance to the Richardson Group and semipermanent buildings. These gate houses are badly needed in order to keep the hospital gates properly protected and to permit patients the freedom of the grounds. If the gates are left open, patients who have the freedom of the grounds may wander away out into the byways or upon the street adjacent to the hospital and get injured, or some who are excited may stray off to the city and commit some act against citizens or some public officer, or attempt to destroy some public buildings or what not. If there were proper gate houses and gatekeepers there would always be some one present to see that these patients do not stray off the hospital grounds, and to direct visitors to the proper buildings when they come to see our patients, and there would be some place for visitors to rest while waiting for cars, and otherwise also benefiting the hospital. For this purpose \$17,000 will be required to build these two houses.

Public comfort stations.—In connection with the gate buildings just mentioned we should have at various places around the reservation public comfort stations, these to be used by visitors, employees, and patients. They are almost essential to the comfort of the patients and visitors at this institution. It is desired to ask an appropriation of \$4,500 for three of these stations.

Propagation building.—The hospital needs a propagation building. Nothing adds more to sick wards than plenty of fresh flowers and plants. These flowers and plants are raised at the hospital greenhouses. Some of the greenhouses that we have here have been in existence many years and need a thorough overhauling. We have had no addition to the number of houses for many years. During this time the hospital has practically doubled in population and number of buildings in use. It is therefore very desirable to have this additional building to raise flowers and plants, and we request that an appropriation of \$2,000 be asked for this purpose.

Staff quarters.—As has been frequently stated, the administration building of the hospital is very crowded and furnishes insufficient office room for our purposes. We have gone over the various buildings repeatedly and do not see how we can add to our office room and continue the offices necessary to be located in one place together except by using other portions of the administration building for office work. The upper floors of the administration building are at present used for staff quarters. This room is needed in order that the staff may do efficient work. Before this space can be taken, separate buildings must be constructed in which to house the staff. It is very essential to the interests and welfare of the patients to have a good part of the staff live on the hospital reservation. We believe it would require nine staff buildings in which to provide quarters

of five rooms for one first assistant physician or chief executive officer, four rooms each for five senior assistant physicians, four rooms each for two clinical directors, four rooms for one internist, four rooms for one director of laboratories, four rooms for one chief psychiatrist, three rooms each for two internists's assistants, three rooms each for six assistant physicians, three rooms for one resident dentist, three rooms for one assistant psychiatrist three rooms each for four laboratory assistants, two rooms each for six junior assistant physicians, and two rooms for an assistant resident dentist, besides the necessary kitchen facilities for these various officers. It is proposed to build staff houses for four families each for the senior assistant physicians and others allowed four rooms, and for the junior assistants and others allowed quarters of three rooms. It is proposed that one building be built for the first assistant physician with five rooms and kitchen, and one built for the junior assistant physicians and resident dentist containing two rooms each and kitchenette arrangement. We recommend that an appropriation of \$222,000 be asked for this purpose.

Dairy and cow barn equipment.—This hospital now has an accredited herd of 200 cows, furnishing an ample supply of the best milk that is obtainable. But the question of getting this milk to the patient in the same condition as when obtained is the problem that confronts us. The milk as handled at the present time is cooled by an old device, carried from the barns to a pastuerizing room adjacent to the meat room in the storehouse, and is then sent in cans to the various kitchens and wards of the hospital. A creamery should be built containing the necessary equipment for pasteurizing and cooking the milk, together with refrigerating and bottling outfits, which would increase the possibility of delivering milk to the patients in the best condition. Four additional silos of 150-ton capacity should be built, two attached to each of the present barns, with a concrete room between to hold the grain, feed, etc. We believe this additional equipment would give us a thoroughly up-to-date economical outfit, and we recommend that an appropriation of \$15,000 be asked for this purpose.

MEDICAL DEPARTMENT.

Training school.—The entrance examination was held at the hospital on October 4, 1919. One hundred and eighty-four attendants entered the examination, 136 of whom passed and were admitted to the junior class. Forty-nine of these were soon dropped on account of lack of interest, inability to keep up with the work, etc., leaving a class of 87. One member of the class died, 6 were discharged during the year, 5 have resigned, 17 voluntarily dropped from class, and 20 failed in their examinations, leaving 38 who have satisfactorily

passed their junior work and been promoted to the senior class. The juniors received 25 lectures, spent 25 hours in recitation, and 24 hours in demonstrations, in addition to their practical work on the wards, which continued throughout the year. The senior class at the beginning of the term consisted of 24 members. Two of them resigned, two were discharged, four failed in their examinations. The seniors received 30 lectures, spent 25 hours in recitation, and 20 hours in demonstration. The nurses from six of the hospitals in the city attended the course in human behavior and mental diseases given to our senior pupils. A special course in dietetics was given the senior class by Miss King, dietitian. Each member of the class received 10 hours' instruction. Tuesday and Friday mornings, special demonstrations conducted by Miss Rumsey were held in the operating room. These included preparation of instruments, dressings, solutions, etc. Four members of the class received these instructions for a period of six weeks at a time. Thirty-five major operations were performed during the year in addition to the minor surgery, reduction of fractures, application of casts, etc. A special course in massage was given the senior class by the chief of the training school. Each pupil spent one month in the hydrotherapy department. Graduating exercises were held in Hitchcock Hall June 9, 1920. Sixteen members of the class received their diplomas.

Staff conferences.

	Male.	Female.	Total.
Discharge.....	710	135	845
Visit.....	125	86	211
Parole.....	318	1	319
Diagnosis.....	32	2	34
Competency.....	119		119
Opinion.....	106	11	117
Transferred.....	8		8
Total.....	1,418	235	1,653
PRESENTATIONS.			
Second time.....	479	49	527
Third time.....	156	17	173
Fourth time.....	54	5	59
Fifth time.....	14	1	15
Sixth time.....	8		8
Seventh time.....	2	2	4
Eighth time.....	3		3
Ninth time.....	1		1
Tenth time.....	1		1
Forty-fifth time.....	1		1
First time.....	719	74	793
	699	161	860
	1,418	235	1,653

Clinical report, physical diseases, July 1, 1919, to June 30, 1920.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	
<i>General diseases.</i>									
Alcoholism.....	1								1
Carcinoma.....	2								2
Chancreoids.....	1								1
Diabetes mellitus.....							6		6
Erysipelas.....	14	1	2		2		2		21
Gonorrhea.....	3								3
Influenza.....	64	58	5		74	29	21		251
Lumbago.....					5		2		7
Malaria.....	1	1	1						3
Parotitis, spec.....	6	10	4	1	3	9	3		36
Pellagra.....					1		1		2
Pleurodynia.....					5				5
Rheumatism.....	1		1		8	2	7	1	20
Acute.....	3	1			14		2		20
Chronic.....	2				5				7
Streptococci septicæmia.....	1	1							2
Syphilis.....	8				14		10		32
Tuberculosis:									
Glandular.....	2								2
Pulmonary.....	28	1	2		7		6		44
Typhoid fever.....	1	1							2
Total.....	138	74	15	1	138	40	60	1	467
<i>Diseases of nervous system; organs of special sense.</i>									
Angioneurotic oedema.....							1		1
Bulbar paralysis.....					1				1
Blepharitis.....						2			2
Cerebral hemorrhage.....	5		3		9	1	1		19
Cerebral tumor.....					1				1
Chorea.....					2				2
Conjunctivitis.....	4	2	4		17		7		34
Disseminated sclerosis.....	1								1
Epilepsy.....	13				4		2		19
General paralysis.....	13				8		1		22
Herpes zoster.....	1				1		1		3
Herpes facialis.....					2				2
Hordeolum.....	1				12		5		18
Kerato-iritis.....			1						1
Meningitis, septic.....							1		1
Migraine.....	2				21	4	4		31
Neuralgia:									
Intercostal.....	1				1				2
Trifacial.....	1				13	6	2		23
Neuritis.....	6								6
Ophthalmia.....	1								1
Otitis media.....			3		4		4		11
Status epilepticus.....	3		2		3		6		14
Torticollis.....					2		1		3
Trophic ulcer.....							1		1
Total.....	52	2	13		100	13	36		217
<i>Diseases of circulatory system.</i>									
Aortic insufficiency.....	1								1
Arteriosclerosis.....	18		7		15		9		49
Cardiac decompensation.....	1								1
Cardio renal disease.....					2				2
Cerebral embolism.....	1		1						2
Endarteritis.....					1				1
Endocarditis.....	4				18		6		28
Gangrene of foot.....	3				2		2		7
Hemorrhage from carcinoma.....							1		1
Hemorrhoids.....	9		2		16		6		33
Hypertension.....					1				1
Hypostatic oedema of leg and foot.....					6		4		10

Clinical report, physical diseases, July 1, 1919, to June 30, 1920—Continued.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	
<i>Diseases of circulatory system—Continued.</i>									
Mitral insufficiency.....	2								2
Myocarditis:									
Acute.....							1		1
Chronic.....	7		5			3	3	1	19
Rupture of heart.....	1								1
Total.....	47		15		61	3	32	1	159
<i>Diseases of respiratory system.</i>									
Asthma.....							1		1
Bronchitis.....	3	2	1		47	3	10		66
Acute.....	19	10	12		57	8	18		124
Coryza.....	17	11	7		1				36
Empyema.....	2	1							3
Epistaxis.....	2								2
Hemorrhagic pneumonia.....	1								1
Laryngitis.....	4	2			8	1	4		19
Pleurisy.....	1	1			1	1			4
Pneumonia:									
Bronchial.....	29	1	2		6	1	3		42
Lobar.....	9	2							11
Rhinitis.....	14	4	9		31	3	19		80
Total.....	101	34	31		151	17	45		389
<i>Diseases of the digestive system.</i>									
Appendicitis, acute.....	1	2	1		1	1			6
Cholecystitis.....	2	1							3
Cholelithiasis.....	1				5		1		7
Colitis.....	20				3				23
Enteritis.....	20		5		77	1			103
Enterocolitis.....	8				6		1		15
Ascariis humobrocoides.....	1				1				2
Gastritis.....	10	1			23	7	17		58
Gastroenteritis.....	1		1		1	2	3		8
Gingivitis.....	1								1
Hernia.....					1				1
Hypochlorhydria.....	1					1			2
Intestinal obstruction.....	2		1						3
Oxyuris-vermicularis.....					1				1
Peritonitis.....	2								2
Pharyngitis.....	2	3	2		2	1	2		12
Proctitis.....	3								3
Stomatitis.....	1	2	2		14	6	1		26
Tonsillitis.....	8	11	4		37	7	7	1	75
Total.....	74	22	16		178	27	49	1	377
<i>Nonvenereal diseases of the urinary system; adnexa.</i>									
Albuminuria.....	7				16	1	8		23
Amenorrhoea.....					1	2			3
Cystitis.....	3				1				4
Dysmenorrhoea.....					47	11	7		65
Endometritis.....							1		1
Menorrhagia.....						3			3
Metrorrhagia.....					2				2
Nonspecific urethritis.....	2		1						3
Nephritis.....	2								2
Acute.....	4		3		8		2		17
Chronic.....	3		3		17		5		28
Pyelitis.....						1			1
Pyelonephritis.....	3								3
Suppurative orchitis.....	1								1
Varicocele.....		1							1
Total.....	25	1	7		92	18	23		661

Clinical report, physical diseases, July 1, 1919, to June 30, 1920—Continued.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	
<i>Diseases of skin cellular tissue.</i>									
Abscess.....	33	12	11		28	1	9		94
Acne vulgaris.....					5				5
Adentitis.....	3								3
Cellulitis.....	11		1						12
Cystic tumor of the lip.....		1							1
Decubitis.....	2		1						3
Dermatitis.....	1				9				10
Dermatitis, venenata.....	2	1							3
Eczema.....	1		1		2	1			5
Epithelioma.....	3								3
Furunculosis.....	21				5				26
Impetigo.....						1			1
Ischio rectal abscess.....			2						2
Mastoiditis acute purulent.....	1								1
Pediculosis.....	1				1				1
Pemphigus.....	1								1
Peritonsillar abscess.....				1					1
Psoriasis.....	2								2
Scabies.....	8				1				9
Tinea, circinata.....			1						1
Tinea, versicolor.....						1			1
Trichophytosis crureus.....	2		1						3
Ulcer.....	4		2						6
Urticaria.....		1			10	1	1		13
Total.....	96	15	20	1	60	5	11		207
<i>Diseases of bones, organs of locomotion.</i>									
Arthritis.....	2		1		4		1	1	9
Bursitis.....	1				1		2		4
Myelosarcoma.....	1								1
Torticollis.....					10		4		14
Total.....	4		1		15		7	1	28
<i>Affections produced by external causes.</i>									
Asphyxiation due to foreign body in the larynx.....	1								1
Burns.....	9	4	3		8		2		26
Cerebral concussion.....	1								1
Dislocation:									
Mandible.....	1								1
Shoulder.....					1				1
Fracture:									
Clavicle.....	2								2
Femur.....	4	2			3				9
Fibula.....	1		1			1	1		4
Great toe.....	1	1					1		3
Hip.....	1				2				3
Mandible.....	1								1
Metacarpals.....	1				1				2
Nasal.....	2								2
Oscalsis.....	1								1
Radius.....			1						1
Rib.....	1								1
Skull.....			1						1
Tibia.....	2		2			1			5
Ulna.....	1		1						2
Rectal hemorrhage.....					1				1
Sprain:									
Ankle.....	4		1		4		2		11
Hand.....	2				2		2		6
Hip.....					2				2
Knee.....	2	1			1				4
Shoulder.....	1		1						2
Wounds:									
Abraded.....	34	3	5		21		7		70
Contused.....	46	4	15	1	33	3	13	1	111

Clinical report, physical diseases, July 1, 1919, to June 30, 1920—Continued.

	Male.				Female.				Total.
	White.		Colored.		White.		Colored.		
	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	Pa- tient.	Em- ployee.	
<i>Deaths—Continued.</i>									
Intestinal obstruction.....	1						1		2
Intestinal ulcer perforation.....	1								1
Meningitis.....	1		1		2				4
Mitral stenosis.....	1								1
Myocarditis, acute.....			1				1		2
Myocarditis, chronic.....	12		8		1		1		22
Myelocarcinoma.....	1								1
Nephritis, acute.....	2		1				1		4
Nephritis, chronic.....	6		1		1				8
Organic brain disease.....	3		3		4		5		15
Paresis.....	42		6		2		3		53
Paresis, juvenile.....			1						1
Pellagra.....					4				4
Pneumonia:									
Bronchial.....	20		3		5		3		31
Hypostatic.....	6		1		1		1		9
Lobar.....	8								8
Pulmonary oedema.....	1								1
Pyonephrosis.....	2								2
Senile dementia.....							1		1
Septicemia, general.....	1								1
Septicemia, streptococic.....	3		1						4
Shock from accidental scald- ing.....	1								1
Shock following escape, ex- posure.....							1		1
Status epilepticus.....	2						1		3
Suicide, hanging.....	2								2
Tuberculosis, pulmonary.....	16		5		2		2		25
Tuberculosis, acute military.....							1		1
Total.....	168	2	42		40	1	29		232

Major operations.

Amputation of foot.....	1
Appendicitis.....	11
Castration.....	2
Cholecystectomy.....	5
Colostomy.....	1
Empyema.....	3
Rectal prolapse.....	1
Removal of glands of neck.....	1
Tracheotomy.....	1
Total.....	26

The above operations were performed by:

Dr. Robert Y. Sullivan, of Washington.

Dr. Lewis H. Taylor, of Washington.

Dr. G. Tully Vaughn, of Washington.

Dr. Charles S. White, of Washington.

These patients were seen previous to operation in consultation by the consulting surgeons. In addition, many other patients were

seen from time to time during the year, nearly every member of the consulting staff being called upon from time to time for advice.

CONTAGIOUS DISEASES.

During the year from July 1, 1919, to June 30, 1920, there were no contagious diseases among our patients, but five employees had parotitis, one had scarlet fever, and one had diphtheria.

Work of the hydrotherapeutic departments.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
Average number of patients treated per month.....	50	1	63	75	189
Average number of treatments per month.....	1,736	1	1,404	1,604	4,745
Patients treated.....	601	1	756	900	2,258
Number of treatments.....	20,837	15	16,846	19,250	56,948

REPORT OF THE CLINICAL PSYCHIATRIST.

Cases given psychotherapeutic attention:

Dementia precox types.....	294
Manic-depressive types.....	88
Paranoid states.....	4
Psychoneuroses.....	15
Total.....	401

A department of occupational therapy has been organized during the year. It is in charge of a director, assisted by 11 aids. It has proven of distinct therapeutic value, serving to arouse and stimulate the interest of many patients. Since October, when the department was started, there have been 570 patients enrolled in the classes.

Aside from the work as above indicated, special wards have been designated in various parts of the institution for the grouping of patients for psychotherapeutic treatment. These wards are in direct charge of the psychotherapist, who is assisted in his work by an occupational aid. Patients are sent to these wards who are either in an acute and presumably recoverable state or for whom it seems possible that something can be accomplished.

REPORT OF OPHTHALMOLOGIST.

Number of visits.....	52
Patients treated.....	473
Male, white.....	224
Female, white.....	135
Male, colored.....	17
Female, colored.....	29
Employees.....	68
Total.....	473

Examinations and treatments:

Eye, refractions.....	231
Other eye conditions.....	112
Nose and throat.....	66
Ear.....	62
Operations.....	5
Total.....	476

DENTAL REPORT.

Total number of patients treated.....	2, 596
Extractions.....	1, 535
Treatments.....	1, 344
Fillings.....	1, 416
Scaling and prophylactic treatments.....	503
New dentures.....	46
Repaired dentures.....	42
Porcelain crowns.....	13
Gold inlays.....	26
Bridges.....	14
Repaired bridges.....	4
Fracture of mandible.....	1
Empyema of antrum.....	3
Necrosis of superior maxilla.....	1

DEPARTMENT OF INTERNAL MEDICINE.

A plan for a new department was created during the year, known as the department of internal medicine.

The function of this department is to care for all patients and employees of the institution who, from any cause, acquire a physical disability, and also to take steps to study the relationship existing between physiological and organic abnormalities and the mental symptoms.

R building was selected and equipment ordered for this purpose. On June 15 two wards and on June 17 a third ward was opened, the first two for white males and the third for white females.

On June 30 there were 34 white males and 30 white females under medical or surgical care.

A diet kitchen has been organized and established on the second floor under the personal supervision of a competent dietitian and is now able to furnish any special diet which may be required in the treatment of any type of case. This is of great benefit in treating the cardiorenal and gastro-intestinal cases especially.

A room has been equipped and set aside for the minor surgical work and the routine salvarsan work.

Those cases requiring surgical measures are attended to in the main operating room in C building and brought to the R building as post-operative cases for further necessary care.

The kitchen in the basement is running under full personnel for the routine feeding of all cases not requiring special diet and for the patient helpers who are working in the building.

Attention has been paid to the treatment of patients suffering from syphilis of the central nervous system. The time of one physician is entirely devoted to this work, the additional facilities in R building being placed at his disposal.

SCIENTIFIC DEPARTMENT.

Clinical pathology.—In the clinico-pathological section of the laboratories a total of 5,462 examinations have been made and reported.

The following table gives an account of this work:

Blood counts, red corpuscles.....	106
Blood counts, white corpuscles.....	339
Blood counts, differential.....	335
Hemoglobin estimations.....	103
Wassermann reactions, blood serum, routine.....	1,357
Wassermann reactions, blood serum, quantitative.....	9
Wassermann reactions, cerebrospinal fluid.....	349
Colloidal gold reactions, cerebrospinal fluid.....	349
Globulin estimations, cerebrospinal fluid.....	349
Cell counts, cerebrospinal fluid.....	349
Feces examinations.....	38
Gastric contents examinations.....	3
Urine examinations, routine.....	1,699
Urine examinations, emergency.....	77
Total.....	5,462

Bacteriological examinations.—Bacteriological examinations to the number of 478 have been made during the year. These have consisted of the following:

Examination of smears, sputum.....	210
Examination of smears, skin lesions.....	21
Examination of smears, blood for malaria.....	34
Examination of smears, urethral.....	15
Examination of smears, vaginal.....	8
Examination of smears, from autopsies.....	10
Widal tests.....	14
Cultures, from blood.....	14
Cultures, from throat.....	30
Cultures, from sputum.....	34
Cultures, from skin lesions.....	45
Cultures, from feces.....	11
Cultures, from urine.....	2
Cultures, from autopsies.....	19
Vaccines made.....	10
Milk analysis, bacteriological.....	10

Psychological laboratory.—The work in the psychological laboratory has continued to be mostly concerned with organic neurological cases.

Numerous demands have been made for both hospital and inter-departmental consultations, with special reference to the reeducation of neurological cases.

Work on the reeducation procedures in organic neurological cases has been continued, and in this work there has been the active cooperation of members of the occupational therapy department.

X-ray work.—Accurate records of cases and of the character of the work performed in the X-ray section of the laboratories were not kept until August 6, 1919. Since that date there have been examined roentgenographically 650 patients for the following:

Chest.....	196
Fractures.....	238
Dental.....	216

In addition to the fluoroscopic examinations, the number of which is not recorded as a routine, plates were made as follows:

14 by 17.....	352
10 by 12.....	150
8 by 10.....	258
Dental films.....	347
Total.....	1,107

Photographic department.—The routine work of photographing patients has continued as in the past. In the Howard Hall group numerous patients whose photographs were not in the case records were photographed to bring that service up to date. The work of the division was as follows:

	Plates.	Prints.
Patients' photographs.....	927	1,055
Laboratory.....	108	284
Administration, etc.....	45	242
Total.....	1,080	1,581

Clinico-pathological meetings of the staff.—During the year there was inaugurated a series of bi-weekly clinico-pathological meetings of the staff to consider matters relating to psychiatry and internal medicine of general interest. Special programs of these meetings were arranged by the senior medical officers in rotation. The department of the laboratories contributed about one-half of the programs.

Evening staff meetings.—During the year there was also inaugurated a series of evening staff meetings at which outside physicians and others having messages of medical interest were invited to lecture,

or to give accounts of their work. Those to whom we are indebted for addresses at these meetings are as follows:

Dr. D. K. Shute, emeritus professor of ophthalmology, George Washington Medical School, "The eye in neurological conditions."

Dr. H. H. Kerr, associate professor of surgery, George Washington Medical School, "The treatment of cases of cerebral paralysis."

Dr. J. B. Watson, professor of psychology, Johns Hopkins University, "The behavior of babies and young infants."

Dr. W. H. R. Rivers, F. R. S., Cambridge University, "The censor."

Dr. H. A. Christian, professor of medicine, Harvard Medical School, "High blood pressure."

Dr. Livingston Farrand, chairman of the executive committee of the American Red Cross, "What the Red Cross is doing."

Instruction.—The laboratories have continued to be used for the purpose of instruction. All the members of the department have contributed to satisfy the numerous demands made upon them in this particular. Besides the regular classes from the George Washington University, in advanced psychiatry and in pathology and neuropathology, there have been demonstrations and lectures on pathology and neuropathology (by Doctors Lewis and Palmer) and on clinical neurology and examination methods (by Dr. Franz) for three separate classes from the Naval Medical School, and for one class from the Army Medical School.

REPORT OF OUT-PATIENT DEPARTMENT.

The service attempted by this department has two objectives: First, to assist the patient leaving the institution to an adjustment of maximum success; second, to aid other individuals at the onset of their difficulty to adapt to the community. In both instances the procedure consists of a scientific study of the patient as a unique combination of conduct determinants, and of an intensive study of his environment as it aggravates his difficulties, with a view to treatment and correction.

This study is conducted at the clinic, detached from the hospital. The psychiatrist is available three days a week, from 2 to 5 p. m., when he carries on his psychological investigations. The observations made by the social worker in investigating the patient's contacts at home, at work, at play, etc., are submitted to him, whose prescription becomes her guide in efforts to bring the aggravating elements under control. The closest cooperation with the hospital, with other hospitals, and with contemporary social agencies is maintained.

The accompanying statistics are self-explanatory. For the hospital, this department aims to be the interlocutor between the institution and its out-patient; investigating home conditions prior to parole, soliciting proper environment and employment for prospectives, observing paroled patients, attempting to locate runaways,

encouraging discharged patients to maintain their contact with the clinic, and recommending to the institution their further disposition.

In the community work at large frequently child-helping agencies refer their defective dependents for examination and recommendation as to proper placement in institutions outside of the District, and hence inaccessible for any follow-up.

Report of cases handled by mental hygiene clinic, 226 Indiana Avenue NW., from Jan. 1, 1920, to July 31, 1920 (inclusive).

OUT-PATIENT SERVICE FOR ST. ELIZABETHS HOSPITAL.

	Patients considered for visit.		Patients on visit.		Eloped patients.		Discharged patients.		Miscellaneous.	Total.
	M.	F.	M.	F.	M.	F.	M.	F.		
Number of patients reporting at clinic.....			17	10	2		3	1		33
Number of visits made by patients to clinic.....			58	29	2		5	3		97
Number of Binet-Simon tests administered.....										
Number of visits made by psychiatric social worker.....	30	53	47	172	14		16	8	217	567
Total.....	30	53	122	211	18		24	12	217	687

COMMUNITY SERVICE.

	Patients referred by Associated Charities.		Patients referred by Board of Children's Guardians.		Patients referred by Juvenile Protectorate.		Other patients.		Miscellaneous.	Total.
	M.	F.	M.	F.	M.	F.	M.	F.		
Number of patients reporting at clinic.....	8	6	28	17	6	5	11	5		86
Number of visits made by patients to clinic.....	8	7	31	17	9	8	22	39		141
Number of Binet-Simon tests administered.....	5	3	24	15	5	2	6	2		62
Number of visits made by psychiatric social worker.....	24		7	5	1		21	29	78	167
Total.....	45	16	90	54	23	15	60	75	78	456

PUBLICATIONS.

White, William A., superintendent:

Thoughts of a psychiatrist on the war and after. Paul B. Hoeber, New York, 1919, p. 137.

Simulation (Malingering). Not an adequate diagnosis. Journal of Nervous and Mental Disease, Vol. 50, No. 3, September, 1919, pp. 209-217.

What is the mental hygiene movement. The Policeman's News, Vol. X, No. 3, September, 1919, p. 20.

(With Dr. S. E. Jelliffe) Diseases of the Nervous System. Lea & Febiger, Philadelphia, 1919, third edition.

The unity of the organism. The Psychoanalytic Review, Vol. VII, No. 1, January, 1920, pp. 71-78.

White, William A—Continued.

Childhood: The golden period for mental hygiene. *Mental Hygiene*, Vol. IV, No. 2, April, 1920, pp. 257-267.

Extending the field of conscious control. *The Psychoanalytic Review*, Vol. VII, No. 2, April, 1920, pp. 148-158.

The contribution of modern psychiatry to general medicine. *Contributions to Medical and Biological Research*, dedicated to Sir William Osler, in Honor of His Seventieth Birthday, July 12, 1919, by his pupils and coworkers. Paul B. Hoeber, New York, 1919, pp. 1226-1237.

Kempf, Edward J., clinical psychiatrist:

The mechanistic classification of neuroses and psychoses produced by distortion of autonomic-affective functions. *The Journal of Nervous and Mental Disease*, Vol. 50, No. 2, pp. 105-113.

The tonus of autonomic segments as causes of abnormal behavior. *Journal of Nervous and Mental Disease*. January, 1920, Vol. 51, No. 1, pp. 1-34.

Lind, John E., senior assistant physician:

Chapter on syphilis of the nervous system in Hazen's "Syphilis."

The situation psychosis, *Medical Record*, July 5, 1919.

STAFF CHANGES, JULY 1, 1919-JUNE 30, 1920.

The following resignations took effect during the year: Ross McM. Chapman, first assistant physician; Leon E. Duval, senior assistant physician; James C. Hassall, clinical director; Edward W. Lazell, assistant clinical psychiatrist; Elsa B. Will, assistant physician; Eleanor B. Saunders, assistant physician; Eva Rawlings, assistant physician; Helen D. Clarke Kempf, junior assistant physician; Bruce B. Robinson, junior assistant physician.

The following appointments were made: Arthur P. Noyes, first assistant physician; Daniel C. Main, clinical director; Watson W. Eldridge, internist; H. G. Palmer, bacteriologist; Albert Smith, senior assistant physician; Loren T. Johnson, senior assistant physician; Roscoe W. Hall, senior assistant physician; Dennis J. Murphy, senior assistant physician; Leroy M. White, assistant physician; Philip J. Trentzsch, assistant physician; Bruce B. Robinson, junior assistant physician; Vernon C. Branham, junior assistant physician; Benjamin Karpman, junior assistant physician; Wm. Bevis, junior assistant physician; Eva Rawlings, assistant physician; Robert J. Hamilton, resident dentist; M. Myron Bogdonoff, dental interne.

STATISTICAL TABLES.

Admissions and discharges.

	Male.			Female.			Total.
	White.	Colored.	Total.	White.	Colored.	Total.	
Remaining June 30, 1919:							
Army.....	1,028	103	1,131	.....	.....	.....	1,131
Navy.....	428	17	445	.....	.....	.....	445
Public Health Service.....	62	5	67	.....	.....	.....	67
Civil life.....	743	335	1,078	542	323	865	1,943
Total.....	2,261	460	2,721	542	323	865	3,586
Admitted during 1919-20:							
Army.....	245	10	255	.....	.....	.....	255
Navy.....	166	9	175	.....	.....	.....	175
Public Health Service.....	16	.....	10	.....	.....	.....	10
Civil life.....	220	132	352	178	77	255	602
Total.....	641	151	792	178	77	255	1,042
Discharged during 1919-20:							
Recovered—							
Army.....	89	10	99	.....	.....	.....	99
Navy.....	88	5	93	.....	.....	.....	93
Public Health Service.....	7	.....	7	.....	.....	.....	7
Civil life.....	38	14	52	26	13	39	91
Total.....	222	29	251	26	13	39	290
Improved—							
Army.....	95	8	103	.....	.....	.....	103
Navy.....	77	1	78	.....	.....	.....	78
Public Health Service.....	2	.....	2	.....	.....	.....	2
Civil life.....	49	18	67	18	12	30	97
Total.....	223	27	250	18	12	30	280
Unimproved—							
Army.....	64	5	69	.....	.....	.....	69
Navy.....	24	.....	24	.....	.....	.....	24
Public Health Service.....	2	.....	2	.....	.....	.....	2
Civil life.....	66	24	90	30	13	43	133
Total.....	156	29	185	30	13	43	228
Not insane—							
Army.....	35	.....	35	.....	.....	.....	35
Navy.....	6	1	7	.....	.....	.....	7
Public Health Service.....	2	.....	2	.....	.....	.....	2
Civil life.....	17	.....	17	19	2	21	38
Total.....	60	1	61	19	2	21	82
Died—							
Army.....	77	8	85	.....	.....	.....	85
Navy.....	21	4	25	.....	.....	.....	25
Public Health Service.....	6	.....	6	.....	.....	.....	6
Civil life.....	63	33	96	38	30	68	164
Total.....	167	45	212	38	30	68	280
Remaining June 30, 1920:							
Army.....	913	82	995	.....	.....	.....	995
Navy.....	378	15	393	.....	.....	.....	393
Public Health Service.....	53	5	58	.....	.....	.....	58
Civil life.....	730	378	1,098	584	330	914	2,022
Total.....	2,074	480	2,554	584	330	914	3,468

Admissions and discharges classified according to sex for the year ended June 30 1920, and since opening of the hospital.

	Year ending June 30, 1920.			Since opening of the hospital.		
	Male.	Female.	Total.	Male.	Female.	Total.
Admitted.....	792	260	1,042	21,591	6,168	27,759
Discharged:						
Recovered.....	312	80	372	6,977	1,574	8,557
Improved.....	250	30	280	3,135	1,068	4,173
Unimproved.....	185	43	228	1,465	518	1,983
Died.....	212	68	280	7,460	2,104	9,564
Remaining.....	2,554	914	3,468			
Total admissions.....				21,591	6,168	27,759

Percentage of total admissions, recovered, improved, etc.

	Male.	Female.	Total.
Recovered.....	32.31	25.52	30.88
Improved.....	14.52	17.13	15.00
Unimproved.....	6.78	8.39	7.12
Died.....	34.55	34.16	34.38
Remaining.....	11.84	14.80	12.12
	100.00	100.00	100.00

Monthly changes of population.

	Admitted.			Discharged.			Died.			Total died and discharged.
	Male.	Female.	Total.	Male.	Female.	Total.	Male.	Female.	Total.	
1919.										
July.....	74	23	97	90	13	103	15	11	26	129
August.....	69	15	84	67	4	71	16	5	21	92
September.....	39	23	62	86	11	97	11	3	14	111
October.....	61	18	79	78	11	89	10	3	13	103
November.....	66	18	84	67	13	80	9	5	14	94
December.....	62	20	82	86	11	97	31	7	38	135
1920.										
January.....	73	19	92	39	4	43	19	5	25	68
February.....	108	21	129	36	6	42	25	10	35	77
March.....	71	23	94	44	6	50	15	7	22	73
April.....	59	23	82	46	19	65	23	4	27	92
May.....	51	23	74	45	19	64	19	7	26	90
June.....	59	24	83	42	17	59	19	1	20	78
Total.....	792	260	1,042	726	184	910	212	68	280	1,140

Ages of patients who died during the year ended June 30, 1920.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
15 to 20 years.....	3	1	4	50 to 60 years.....	23	15	38
20 to 25 years.....	9	1	10	60 to 70 years.....	24	13	37
25 to 30 years.....	15	2	17	70 to 80 years.....	45	13	58
30 to 35 years.....	18	4	22	80 to 90 years.....	14	5	19
35 to 40 years.....	26	5	31	Over 90 years.....		1	1
40 to 45 years.....	19	5	24	Total.....	212	68	280
45 to 50 years.....	16	3	19				

Ages of patients admitted during the year ended June 30, 1920.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
13 to 15 years.....	3	.....	3	50 to 60 years.....	54	34	88
15 to 20 years.....	64	19	83	60 to 70 years.....	27	19	46
20 to 25 years.....	142	19	161	70 to 80 years.....	26	17	43
25 to 30 years.....	92	30	122	80 to 90 years.....	6	4	10
30 to 35 years.....	73	21	94	90 to 100 years.....	2	1	3
35 to 40 years.....	60	22	82	Unknown.....	149	19	168
40 to 45 years.....	54	23	77	Total.....	792	250	1,042
45 to 50 years.....	40	22	62				

Civil condition of patients admitted during the year ended June 30, 1920.

	Male.	Female.	Total.
Single.....	506	98	604
Married.....	219	92	311
Widowed.....	42	46	88
Divorced.....	4	.....	4
Unknown.....	21	14	35
Total.....	792	250	1,042

Duration of mental disease of patients who died during the year ended June 30, 1920.

Age.	Male.	Female.	Total.	Age.	Male.	Female.	Total.
1 to 2 months.....	17	15	32	6 to 10 years.....	14	6	20
2 to 4 months.....	21	15	36	10 to 15 years.....	7	3	10
4 to 6 months.....	16	5	21	15 to 20 years.....	12	1	13
6 to 9 months.....	22	3	25	20 to 25 years.....	3	1	4
9 to 12 months.....	17	2	19	Over 25 years.....	10	2	12
1 to 2 years.....	31	6	37	Total.....	212	68	280
2 to 4 years.....	26	5	30				
4 to 6 years.....	17	4	21				

Ages of patients discharged recovered during the year ended June 30, 1920.

Age.	Male.	Female.	Total.
15 to 20 years.....	52	6	58
20 to 30 years.....	156	12	168
30 to 40 years.....	22	9	31
40 to 50 years.....	14	8	22
50 to 60 years.....	3	3	6
60 to 70 years.....	4	1	5
Total.....	251	39	290

Duration of residence in the hospital of those recovered during the year ending June 30, 1920.

	Male.		Female.		Total.
	White.	Colored.	White.	Colored.	
20 to 30 days.....	7	2	3	1	13
1 to 2 months.....	16	3	4	1	24
2 to 3 months.....	47	3	.....	.....	50
3 to 4 months.....	46	7	1	1	55
4 to 6 months.....	38	3	3	1	45
6 to 9 months.....	42	2	2	1	47
1 to 2 years.....	11	4	6	6	27
2 to 4 years.....	9	2	5	2	18
Over 4 years.....	6	3	2	.....	11
Total.....	222	29	26	13	290

REPORT OF ST. ELIZABETHS HOSPITAL.

Persons admitted during the year and since opening of the hospital in 1855.

	During year.	Since 1855.		During year.	Since 1855.
Foreign born—Continued.					
British Columbia.....	8	117	British Columbia.....		2
British Possessions.....	3	62	British Possessions.....		4
British West Indies.....	1	4	British West Indies.....		17
Buenos Aires.....	2	74	Buenos Aires.....	1	4
Bulgaria.....	2	26	Bulgaria.....	2	2
Canada.....	7	172	Canada.....	10	218
Cape Verde Islands.....	1	25	Cape Verde Islands.....		2
Chile.....	3	55	Chile.....		2
China.....	153	3,565	China.....	1	7
Coast of Africa.....	2	38	Coast of Africa.....		5
Costa Rica.....	18	236	Costa Rica.....		3
Cuba.....	19	435	Cuba.....		11
Cyprus.....	12	384	Cyprus.....		1
Denmark.....		19	Denmark.....	1	68
England.....		4	England.....	13	469
Ecuador.....	6	129	Ecuador.....		1
Finland.....	2	94	Finland.....	2	27
France.....	13	419	France.....	1	126
Germany.....	3	97	Germany.....	31	1,801
Greece.....	3	190	Greece.....	3	44
Guatemala.....	63	1,961	Guatemala.....		1
Hawaiian Islands.....	19	726	Hawaiian Islands.....	1	8
Holland.....	9	210	Holland.....		24
Hungary.....	2	74	Hungary.....	2	51
Iceland.....	7	108	Iceland.....		1
India.....	8	267	India.....	1	1
Ireland.....		4	Ireland.....	23	2,535
Italy.....		33	Italy.....	19	193
Japan.....		1	Japan.....	1	19
Korea.....	3	112	Korea.....		1
Malta.....	18	308	Malta.....		3
Mexico.....		7	Mexico.....		20
Moravia.....	43	1,692	Moravia.....	1	1
New Brunswick.....	15	322	New Brunswick.....		4
New Foundland.....	24	924	New Foundland.....		5
New Grenada.....	3	20	New Grenada.....		1
Norway.....		13	Norway.....	3	90
Nova Scotia.....	40	1,389	Nova Scotia.....		27
Panama.....	1	91	Panama.....		1
Paris Islands.....	12	163	Paris Islands.....	1	1
Philippine Islands.....	10	258	Philippine Islands.....		26
Poland.....	4	174	Poland.....	4	60
Portugal.....		7	Portugal.....		11
Prince Edward Islands.....	3	97	Prince Edward Islands.....	1	4
Prussia.....	90	2,598	Prussia.....		42
Porto Rico.....	2	8	Porto Rico.....	1	16
Roumania.....	6	137	Roumania.....		13
Russia.....	3	79	Russia.....	15	225
Saxony.....			Saxony.....		7
Servia.....			Servia.....		3
Sicily.....			Sicily.....		3
Spain.....			Spain.....	2	14
Sweden.....			Sweden.....	1	146
Switzerland.....			Switzerland.....	1	94
Turkey.....			Turkey.....		13
Venezuela.....			Venezuela.....		1
Wales.....			Wales.....		24
West Indies.....			West Indies.....	1	16
At sea.....			At sea.....		1
Unknown.....			Unknown.....	36	979
Total.....			Total.....	197	7,899
Grand total.....			Grand total.....	1,042	27,759
Foreign born:					
Alsace.....		2			
Armenia.....		5			
Austria.....	18	195			
Bahamas.....	2	2			
Bavaria.....		17			
Belgium.....		11			
Bermuda.....		2			
Bohemia.....		15			
Brazil.....		2			
British East Indies.....		9			
	845	19,890			

Admissions, discharges, and deaths, with the mean annual mortality and proportion of recoveries, per cent of the discharges, including deaths, for each year since the opening of the hospital.

Year.	Admitted.		Discharged.						Remaining June 30 in each year.		Daily average.		Percentage of recoveries in discharges.		Percentage of deaths on average number.		Percentage of deaths on total number.	
	M.	F.	Recovered.		Improved.		Unimproved.		Died.		M.	F.	Total.	M.	F.	Total.	M.	F.
			To-tal.	F.	To-tal.	F.	To-tal.	F.	To-tal.	F.								
1855	26	37	63	3	3	3	1	1	1	1	26	34	60	19	35	54	100	100
1856	29	57	86	4	4	4	3	3	3	3	29	59	88	20	38	58	70	70
1857	20	27	47	5	5	5	2	2	2	2	19	26	45	11	14	25	36	36
1858	23	18	41	5	5	5	2	2	2	2	23	18	41	14	10	24	23	23
1859	29	18	47	5	5	5	2	2	2	2	29	18	47	14	10	24	23	23
1860	64	34	98	11	11	11	2	2	2	2	64	34	98	14	10	24	23	23
1861	174	112	286	49	49	49	2	2	2	2	174	112	286	14	10	24	23	23
1862	330	235	565	94	94	94	1	1	1	1	330	235	565	14	10	24	23	23
1863	484	265	749	127	127	127	1	1	1	1	484	265	749	14	10	24	23	23
1864	468	265	733	127	127	127	1	1	1	1	468	265	733	14	10	24	23	23
1865	194	109	303	53	53	53	1	1	1	1	194	109	303	14	10	24	23	23
1866	190	109	299	53	53	53	1	1	1	1	190	109	299	14	10	24	23	23
1867	133	83	216	36	36	36	1	1	1	1	133	83	216	14	10	24	23	23
1868	146	84	230	36	36	36	1	1	1	1	146	84	230	14	10	24	23	23
1869	120	64	184	28	28	28	1	1	1	1	120	64	184	14	10	24	23	23
1870	120	64	184	28	28	28	1	1	1	1	120	64	184	14	10	24	23	23
1871	133	83	216	36	36	36	1	1	1	1	133	83	216	14	10	24	23	23
1872	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1873	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1874	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1875	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1876	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1877	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1878	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1879	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1880	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1881	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1882	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1883	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1884	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1885	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1886	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1887	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1888	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1889	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1890	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23
1891	170	109	279	45	45	45	1	1	1	1	170	109	279	14	10	24	23	23

Admissions, discharges, and deaths, with the mean annual mortality and proportion of recoveries, per cent of the discharges, including deaths, for each year since the opening of the hospital—Continued.

Year.	Admitted.			Discharged.						Remaining June 30 in each year.			Daily average.			Percentage of recoveries in discharges.			Percentage of deaths on average numbers.			Percentage of deaths on total number.													
				Recovered.			Improved.			Unimproved.			Died.																						
	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.	M.	F.	To-tal.											
1891-92.....	233	70	303	56	12	68	69	13	82	8	4	3	11	121	32	163	1	226	64	348	0.51	675	29	22	0.5	20	0.0	21	0.6	9.86	9.18	9.71	8.14	7.53	8.01
1892-93.....	261	84	345	57	10	67	46	23	69	6	1	5	6	140	41	181	1	242	50	371	0.20	582	59	23	0.6	22	0.3	20	0.8	11.41	11.48	11.44	9.38	9.37	9.32
1893-94.....	273	88	361	49	13	62	49	22	71	6	1	5	6	138	29	167	1	255	56	384	0.16	618	07	20	0.4	13	0.4	20	0.6	11.31	11.32	11.30	9.06	7.46	8.72
1894-95.....	293	78	371	68	30	98	40	32	72	7	1	8	146	1	318	36	179	1	248	136	191	0.16	667	03	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1895-96.....	278	92	370	74	15	89	39	14	53	7	1	8	146	1	330	32	167	1	248	136	191	0.16	667	03	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1896-97.....	298	88	377	67	17	84	50	44	94	5	1	5	130	1	307	32	162	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1897-98.....	347	90	437	84	12	96	30	19	49	8	1	9	107	1	425	32	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1898-99.....	498	105	603	173	16	189	99	29	88	38	10	48	158	1	405	32	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1899-1900.....	434	117	551	118	33	151	55	25	77	11	6	13	152	1	660	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1900-1901.....	519	136	655	202	33	235	52	25	77	11	6	17	193	1	759	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1901-2.....	532	154	686	209	39	248	78	20	98	11	6	20	137	1	817	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1902-3.....	554	180	734	211	50	261	105	25	130	19	6	25	189	1	877	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1903-4.....	584	182	766	194	42	236	101	42	143	12	9	34	189	1	877	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1904-5.....	493	174	667	151	53	204	101	42	143	12	9	34	189	1	877	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1905-6.....	421	180	601	173	60	233	94	33	127	29	13	42	150	1	912	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1906-7.....	437	182	619	186	45	231	102	32	134	28	12	40	165	1	912	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1907-8.....	472	171	643	123	39	162	80	32	110	28	5	33	156	1	998	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1908-9.....	517	174	691	133	60	193	52	30	82	35	7	42	185	1	1,011	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1909-10.....	496	154	650	115	56	171	54	20	74	35	26	81	189	1	1,011	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1910-11.....	443	180	623	165	50	215	47	13	60	96	26	122	212	1	1,116	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1911-12.....	543	180	723	160	51	211	33	19	52	72	30	102	258	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1912-13.....	549	197	746	125	49	174	37	20	57	70	34	104	252	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1913-14.....	572	180	752	115	48	163	42	18	60	99	44	133	267	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1914-15.....	471	185	656	103	30	133	50	23	73	71	28	99	265	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1915-16.....	617	198	815	128	47	175	52	29	81	74	30	104	271	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1916-17.....	668	230	898	170	50	220	61	31	92	72	28	100	286	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1917-18.....	896	168	1,064	284	52	336	113	18	131	98	25	122	347	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1918-19.....	1,549	253	1,802	538	57	595	261	39	300	157	48	195	396	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	
1919-20.....	792	250	1,042	312	60	372	250	30	280	185	43	228	212	1	1,201	35	163	1	246	134	194	0.17	669	33	27	0.8	30	0.6	11.11	11.16	11.13	9.10	7.46	8.72	

Eighty-two "not insane," 61 males and 21 females, are included with recovered in 1919-20.

Detailed statement of receipts and expenditures for the fiscal year ending June 30, 1919 (additional).

RECEIPTS.

Balance on hand as stated in last report:

Support, 1919.....	\$63,003.03
Deficiency, act March 6, 1920.....	1,358.48
Deficiency, act June 5, 1920.....	4,297.46
Board of District of Columbia patients.....	37,924.37
Board of Marine Hospital Service patients.....	5,066.78
Board of other patients.....	44,165.94
Sale of stock, etc.....	1,371.51

Buildings and grounds, 1919:

General repairs and improvements.....	8,559.43
Roadways, grading and walks.....	58.75
Isolation building.....	5,000.00
Railroad track scale.....	6,928.23

177,744.98

EXPENDITURES.

Provisions and supplies:

Class 1. Farinaceous foods.....	\$1,325.85
2. Yeast.....	84.75
3. Meats, fresh.....	9,186.82
4. Poultry.....	35.50
5. Meats, salt and smoked.....	1,457.13
6. Fish, fresh.....	612.20
7. Fish, salt.....	255.52
8. Vegetables, fresh.....	1,927.50
9. Vegetables, canned.....	162.50
10. Fruits, fresh.....	802.56
11. Fruits, dried.....	70.00
12. Dairy products.....	128.54
13. Groceries, wet.....	42.00
14. Groceries, dry.....	2,691.74
15. Laundry supplies.....	128.40
16. Crockery and chinaware.....	39.00
17. Tin and ironware.....	225.89
18. Household supplies.....	1,297.18
19. Fuel.....	71,420.71
	<hr/>
	91,893.79

Furniture and bedding:

Class 20. Bedding.....	8,750.20
21. Window furniture.....	86.36
	<hr/>
	8,836.56

Dry goods and clothing:

Class 22. Clothing, new.....	120.00
23. Clothing material.....	5,534.31
24. Shoes and slippers, men's.....	45.60
	<hr/>
	5,699.91

Medical supplies:

Class 25. Medical supplies.....	278.61
26. Surgical supplies.....	37.06
27. Laboratory supplies.....	445.73
	<hr/>
	761.40

Farm and garden:

Class 28. Stable maintenance.....	\$12.60	
29. Farm feed.....	815.01	
30. Dairy feed.....	2,832.00	
31. Poultry feed.....	161.36	
		\$3,820.97

Miscellaneous:

Class 32. Supply transportation.....	22.15	
33. Return of escaped patients.....	30.00	
34. Messages.....	515.17	
35. Advertisements.....	529.14	
36. Miscellaneous.....	8,096.49	
		9,192.95

Books and stationery:

Class 37. Stationery supplies.....	.44	
38. Periodicals.....	163.05	
		163.49

Construction:

Class 39. Engineers' supplies.....	879.73	
40. Electrical supplies.....	1,403.48	
41. Carpenters' supplies.....	414.80	
42. Painters' supplies.....	28.52	
		2,726.53

Buildings and grounds:

Class 43. Pay roll, roadways, grading and walks.....	45.00	
44. Pay roll, general repairs and improvements..	2,186.90	
45. General repairs and improvements.....	6,235.34	
46. Railroad track scale.....	6,927.03	
		15,394.27

Salaries and wages:

Class 47. Officers.....	4,329.51	
48. Administrative.....	3,331.78	
49. Ward service.....	8,721.18	
50. Domestic service.....	957.92	
51. Kitchen service.....	2,086.49	
52. Laundry service.....	1,082.50	
53. Fire department.....	83.34	
54. Engineers.....	3,641.70	
55. Carpenters and builders.....	755.36	
56. Tinnners.....	100.00	
57. Painters.....	700.00	
58. Electricians.....	525.02	
59. Farm and garden.....	1,955.49	
60. Stable.....	695.00	
61. Dairy and cow barns.....	706.00	
62. Lawns and grounds.....	645.09	
		32,316.38

Balance in the United States Treasury:

Support.....	1,786.59	
General repairs and improvements.....	137.19	
Roadways, grading and walks.....	13.75	
Isolation buildings.....	5,000.00	
Railroad track scale.....	1.20	
		6,938.73

Total..... 177,744.98

Detailed statement of receipts and expenditures for the fiscal year ending June 30, 1920.

RECEIPTS.

Appropriated for:

Support, 1920.....	\$1, 000, 000. 00
Deficiency.....	100, 000. 00
Disallowance, refund pay roll.....	120. 00
District of Columbia patients.....	787, 137. 12
Board of Marine Hospital Service patients.....	22, 915. 30
Board of other patients.....	26, 506. 16
Sale of stock, etc.....	6, 719. 24
Buildings and grounds, 1920:	
General repairs and improvements.....	60, 000. 00
Roadways, grading and walks.....	5, 000. 00
Buildings and grounds, continuous:	
Shop and storehouse.....	13, 685. 36
Semipermanent buildings.....	2, 848. 84
Increased compensation.....	231, 594. 20
	<hr/>
	2, 256, 526. 22

EXPENDITURES.

Provisions and stores:

Class 1. Farinaceous foods.....	\$84, 022. 31
2. Yeast.....	743. 35
3. Meats, fresh.....	132, 162. 16
4. Poultry.....	8, 010. 76
5. Meats, salt and smoked.....	63, 405. 25
6. Fish, fresh.....	7, 086. 53
7. Fish, salt.....	7, 747. 38
8. Vegetables, fresh.....	30, 669. 67
9. Vegetables, canned.....	16, 705. 53
10. Fruits, fresh.....	537. 65
11. Fruits, dried.....	10, 300. 99
12. Dairy products.....	54, 029. 54
13. Groceries, wet.....	14, 262. 80
14. Groceries, dry.....	53, 239. 91
15. Condiments.....	510. 13
16. Laundry supplies.....	15, 781. 05
17. Crockery and china.....	7, 508. 20
18. Tin and ironware.....	9, 157. 51
19. Cutlery and plated ware.....	863. 70
20. Household supplies.....	19, 179. 58
21. Toilet articles.....	2, 841. 47
22. Fuel.....	168, 310. 12

707, 075. 61

Furniture and bedding:

Class 23. Furniture.....	7, 098. 38
24. Bedding.....	38, 252. 77
25. Window furniture.....	1, 222. 16
26. Table linen.....	8, 021. 34
28. Sewing-machine supplies.....	398. 57
29. Carpets, etc.....	7, 057. 76

62, 050. 98

Dry goods and clothing:

Class 30. Clothing, new.....	\$20, 871. 31
31. Clothing material.....	22, 622. 21
32. Hats, straw.....	414. 70
33. Hats, felt.....	592. 80
34. Hosiery.....	3, 962. 70
35. Haberdashery.....	1, 247. 13
36. Shoes and slippers, men's.....	16, 559. 13
37. Shoes and slippers, women's.....	2, 455. 60
37a. Occupational supplies.....	508. 53

\$69, 234. 11

Medical supplies:

Class 38. Medical supplies.....	6, 293. 95
39. Surgical supplies.....	4, 215. 93
40. Laboratory supplies.....	3, 108. 90

13, 618. 78

Farm and garden:

Class 41. Wagons and harness.....	1, 158. 55
42. Farm and garden implements.....	678. 29
43. Lawns, roads and grounds.....	106. 41
44. Farm supplies.....	380. 43
45. Horticultural supplies.....	3, 703. 35
46. Stable maintenance.....	223. 90
47. Live stock.....	2, 740. 33
48. Farm feed.....	14, 024. 91
49. Dairy feed.....	44, 125. 01
50. Poultry feed.....	1, 589. 55

68, 730. 73

Miscellaneous:

Class 51. Entertainment of patients.....	1, 328. 94
53. Supply transportation.....	659. 89
54. Return of escaped patients.....	465. 00
55. Messages.....	2, 412. 11
56. Advertisements.....	537. 03
57. Miscellaneous.....	1, 743. 91
58. Transportation of patients.....	8. 00

7, 154. 88

Books and stationery:

Class 59. Stationery supplies.....	214. 03
61. Books.....	372. 98
62. Periodicals.....	227. 09

814. 10

Construction:

Class 63. Engineers' supplies.....	9, 929. 48
64. Electrical supplies.....	10, 642. 70
65. Carpenters' supplies.....	1, 761. 09
66. Tinnern's supplies.....	138. 19
67. Painters' supplies.....	10, 677. 89

33, 149. 35

Buildings and grounds:

Class 68. Pay roll, roadways.....	4, 998. 84
70. Pay roll, repairs and improvements.....	30, 468. 97
71. General repairs and improvements.....	21, 967. 50
72. Semipermanent buildings.....	2, 830. 30
73. Shop and storehouse.....	3, 541. 80
93. Pay roll, shop and storehouse.....	2, 758. 22

66, 565. 63

Salaries and wages:

Class 75. Officers.....	\$79,294.12	
76. Administrative.....	67,310.17	
77. Ward service.....	347,783.15	
78. Domestic service.....	8,112.59	
79. Kitchen service.....	55,182.46	
80. Industrial.....	10,129.49	
81. Laundry service.....	18,495.48	
82. Fire department.....	1,213.33	
83. Engineers.....	65,645.90	
84. Carpenters and builders.....	5,846.99	
85. Tinnern.....	1,533.12	
86. Construction.....	6,057.84	
87. Painters.....	8,900.00	
88. Electricians.....	8,012.31	
89. Farm and garden.....	29,497.84	
90. Stables.....	11,901.50	
91. Dairy and cow barns.....	9,732.30	
92. Lawns and grounds.....	6,989.09	
		\$741,637.68

Increased compensation..... 231,594.20

On hand:

Support.....	239,931.60	
Buildings and grounds, 1920—		
General repairs and improvements.....	7,563.53	
Roadways, grading and walks.....	1.16	
Buildings and grounds, continuous—		
Shop and storehouse.....	7,385.34	
Semipermanent buildings.....	18.54	
		254,900.17
		2,256,526.22

Summary of expenditures.

Current expenses:

Salaries and wages.....	\$741,637.68
Clothing.....	69,234.11
Subsistence.....	707,075.61
Ordinary repairs.....	33,149.35
Office, domestic and outdoor expenses.....	152,369.47
	1,703,466.22

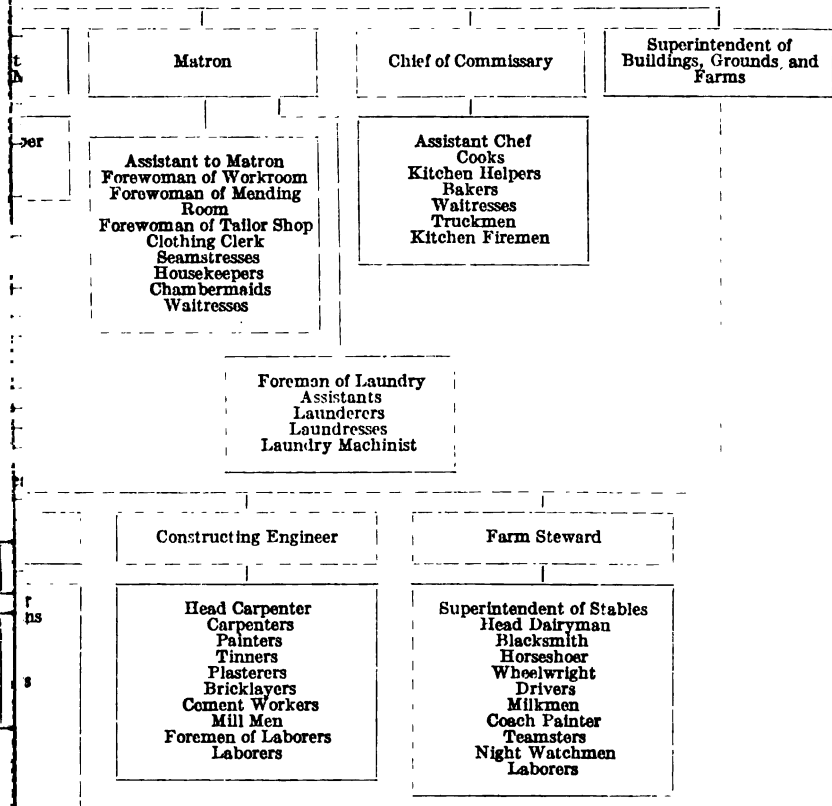
Extraordinary expenses:

Permanent improvements to existing buildings.....	57,435.31
New buildings.....	9,130.32

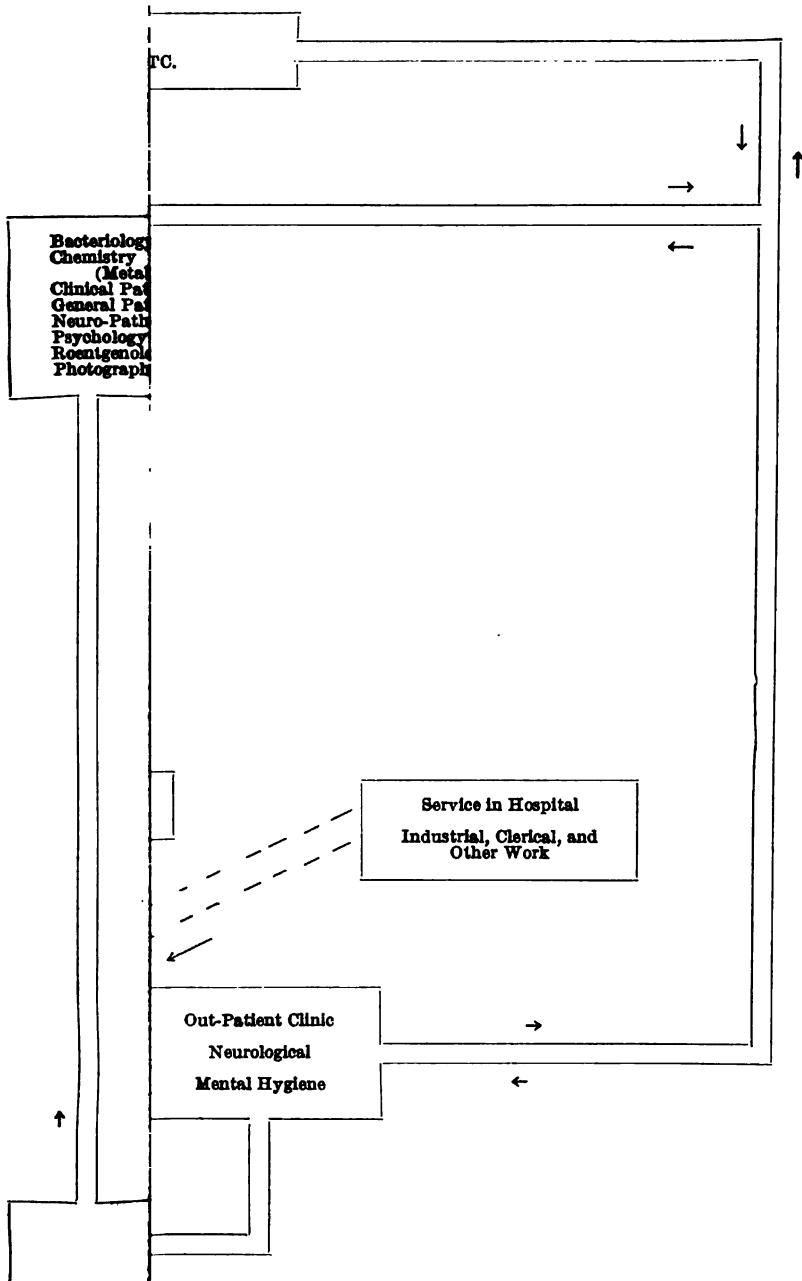
Grand total..... 1,770,031.85

The report for this year includes expenditures to June 30, 1920, only. The balance of expenditures will be shown in the supplement in next year's report.

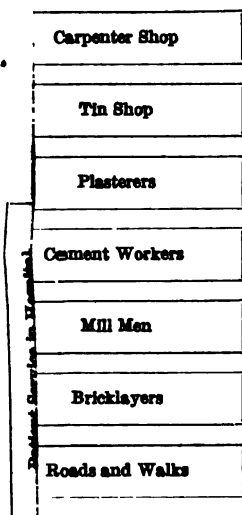
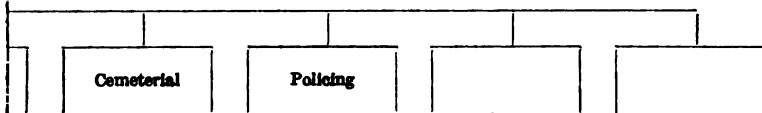
	Male.	Female.	Total.
Patients at beginning of fiscal year.....	2,721	865	3,586
Patients received during the year.....	892	250	1,042
Patients discharged and died during the year.....	959	201	1,160
Patients remaining at end of fiscal year.....	2,554	914	3,468
Daily average number of patients.....	2,599	890	3,480
Average number of officers and employees.....	691	406	1,097



SION



11759



Requirements
St. Elizabeths Hospital

SIXTY-THIRD ANNUAL REPORT *of the* COLUMBIA INSTITUTION FOR THE DEAF

TO THE

SECRETARY OF THE INTERIOR



FOR THE FISCAL YEAR
ENDED JUNE 30
1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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OFFICERS OF THE INSTITUTION.

Patron.—Woodrow Wilson, President of the United States.

President.—Percival Hall, M. A., Litt. D.

Secretary.—Rev. Ulysses G. B. Pierce.

Treasurer.—H. Ralph Burton.

Directors.—Hon. Atlee Pomerene, Senator from Ohio; Hon. John E. Raker, Member of Congress from California; Hon. S. G. Porter, Member of Congress from Pennsylvania; representing the Congress of the United States. Theodore W. Noyes, Esq., Charles Herbert Stockton, LL. D., Martin A. Knapp, LL. D., David Jayne Hill, LL. D., citizens of the District of Columbia; John B. Wight and Ernest G. Draper, citizens of New York, the president and the secretary of the institution.

FACULTY AND OFFICERS OF GALLAUDET COLLEGE, 1919-20.

President and professor of applied mathematics and pedagogy.—Percival Hall, M. A., Litt. D.

Vice president and professor of languages.—Edward Allen Fay, M. A., Ph. D., Sc. D., Litt. D.

Professor of English and history.—John Burton Hotchkiss, M. A., Litt. D.

Professor of natural science.—Charles Russell Ely, M. A., Ph. D.

Professor of English and biology.—Herbert E. Day, M. A.

Professor of mathematics and engineering.—Isaac Allison, E. E.

Professor of Latin and English.—Elizabeth Peet, B. A.

Assistant professor of Latin and natural science.—Victor O. Skyberg, M. A.

Instructor in mathematics and physical director.—Frederick H. Hughes, M. A.

Assistant professor of agriculture.—Harley D. Drake, B. A., M. S.

Emeritus instructor in drawing.—Arthur D. Bryant, B. Ph.

Instructor in English and history.—Irving S. Fustfeld, M. A.

Instructor in applied art and drawing, and in charge of college women.—Charlotte E. Weiss.

Librarian and instructor in gymnastics.—Edith M. Nelson, M. A.

Instructor in printing.—James Y. Johnson.

Registrar and secretary to the president.—Lois Herrington.

DEPARTMENT OF ARTICULATION AND NORMAL INSTRUCTION, 1919-20.

In charge.—Percival Hall, M. A., Litt. D.

Instructors.—Sarah Harvey Porter, M. A., Annie E. Jameson, Arthur L. Roberts, M. A.

Normal fellows.—Leslie M. Brown, B. A.,¹ Dartmouth College; Olive Aida Whildin, B. A., Goucher College.

Normal student.—Jerome Hicks, Randolph-Macon Institute, Virginia.

FACULTY OF THE KENDALL SCHOOL, 1919-20.

President.—Percival Hall, M. A., Litt. D.

Principal.—Arthur L. Roberts, M. A.

Instructors.—Helen Fay, Grace Ely, Grace Coleman, B. A., Mary Deem, Ida Gaarder.

Instructor in sewing and cooking.—Agnes E. Suman.

Instructor in art and manual training.—Margaret E. Wafer.

Instructor in carpentry.—Norman Herrington.

DOMESTIC DEPARTMENT, 1919-20.

Supervisor and disbursing agent.—Louis L. Hooper, M. A.

Attending physician.—H. H. Donnally, M. D.

Dentist.—Elliott Hunt, D. D. S.;¹ Charles V. Stieffel, D. D. S.

Matron, Gallaudet College.—Mrs. Cora V. Troup.

Boys' matron, Kendall School.—Mrs. Arthur L. Roberts.

Girls' matron, Kendall School.—Miss Iona White.

Girls' supervisor.—Ruth Atkins.

Boys' supervisor.—Robey Burns.

Master of shop.—Norman Herrington.

Gardener.—Edward Mangum.

Farm manager.—Harley D. Drake, M. S.

Chief engineer.—W. J. Muir.

¹ Resigned during the year.

REPORT OF THE COLUMBIA INSTITUTION FOR THE DEAF.

COLUMBIA INSTITUTION FOR THE DEAF,
KENDALL GREEN,
Washington, D. C., September 1, 1920.

SIR: During the fiscal year July 1, 1919, through June 30, 1920, there were under instruction in the advanced department of the institution, known as Gallaudet College, 70 men and 56 women, a total of 126, representing the District of Columbia, Canada, and 33 States. This is an increase of 20 compared with the preceding year.

In the primary department, known as the Kendall School, there were under instruction 28 boys and 30 girls, a total of 58. This is an increase of 7 compared with the preceding year. Of the total in this department, 45 were admitted as beneficiaries of the District of Columbia.

There were admitted to the institution 30 females and 36 males; discharged 25 males and 32 females.

A list of names of students and pupils who have been under instruction since July 1, 1919, and a list of those admitted for the school year 1920-21 will be found appended to this report.

HEALTH.

During the fall and early part of the winter of 1919 there were a few mild cases of grippe among our students, but none resulted seriously. There were three cases of appendicitis requiring operation. A double operation for the removal of stones from kidneys was also successfully carried out for one of the students of the advanced department. There were two operations for tonsillectomy. We were very fortunate in all of these serious operations to have the outcome entirely successful.

One case of diphtheria brought in from outside our institution occurred in the Kendall School. Cultures taken from all the students of the institution showed four carriers, none of whom was really ill and none of whom, as far as could be found, conveyed the disease to other students or pupils.

Two fractures of the forearm, caused by falls, were reduced.

Dental work at cost was carried out throughout the year in our own dental room with marked improvement in the general condition of the teeth of our students and pupils.

Except for the unusual number of surgical cases, the health of the students on the whole was good.

Examinations of milkers employed in our dairy were made regularly during the year and samples of milk submitted to the health department a number of times for bacteriological examination. The dairy herd was tested and found for the third year to be free from

tuberculosis, and on June 15 a certificate from the Department of Agriculture of tuberculosis-free accredited herd was issued to our institution.

An examination of the food supply and kitchens was made during the year by Miss Mildred Gordon, of the District public schools, at the request of the president of the institution. A number of valuable suggestions were obtained in this manner. The report showed, in general, good service and a sufficient quantity and variety of food for the needs of the pupils.

At the close of the fiscal year under review the board of directors voted to require a physical examination from all candidates desiring to enter the advanced department of the institution.

CHANGES IN THE CORPS OF OFFICERS AND TEACHERS.

During the winter Dr. Edward Allen Fay, vice president of the college, expressed a desire to be relieved of a number of his regular duties because of advanced age. The board of directors voted to make him vice president emeritus beginning October 1, 1920, to grant him the sum of \$1,500 per year recently given to the institution by Mr. W. H. Childs, of New York, for the benefit of retiring professors or teachers in the college, and to allow him the use of his residence and additional compensation for a limited amount of work of instruction in the higher department.

Dr. Charles R. Ely was appointed vice president, to take effect October 1, 1920.

At the close of the fiscal year Miss Annie E. Jameson, instructor in articulation for 14 years, resigned to retire from the profession. Her work will be divided for the coming year among the present instructors, the special duty of teaching the normal students the art of speech teaching being assigned to Miss Grace Coleman.

Mr. Robey Burns, supervisor of boys in the Kendall School, resigned to enter business. His place has been filled by the appointment of John G. Young.

In accordance with a vote of the board of directors, the president of the institution was authorized to employ an instructor in domestic science for the young women of the advanced department. Miss Cornelia H. Rauch, a graduate of Hood College, has been appointed to take charge of the domestic science work and to relieve Miss Nelson of the work in physical training.

COURSE OF INSTRUCTION.

The course of instruction was added to at the beginning of the school year just closed by the introduction of special instruction for one term in the use of the library. This course was given for the benefit of the entering class in the advanced department.

Fifteen young women of this department were also given the benefit of special instruction in typewriting in order to make it more easily possible for them to obtain clerical positions.

Arrangements have been made for the coming school year for special instruction in domestic science for the young women of Gallaudet College.

In the Kendall School the course of instruction has remained substantially as reported heretofore.

LECTURES.

The following special lectures have been delivered during the year:

IN THE COLLEGE.

What Doctors and Medicines Cannot Do (a health talk).....	Dr. Hotchkiss
Evolution.....	Dr. Ely
Emergencies, and How to Treat Them.....	Prof. Day
Lost.....	Prof. Allison
Manners, Good and Bad.....	Miss Peet
Vocational Training for Disabled Soldiers.....	Mr. Skyberg
The Motion Picture—Its Development and Influence (illustrated).....	Mr. Hughes
The Menace to Civilization—Bolshevism.....	Mr. Fufeld
The Milk of Cattle.....	Mr. Drake

IN THE KENDALL SCHOOL.

If I were King.....	Mr. Roberts
The Lady of the Lake.....	Miss Gaarder
Huckleberry Finn.....	Mr. Brown
The Courtship of Miles Standish.....	Mr. Burns
The Tinder Box.....	Miss Coleman
Legends of the Rhine.....	Miss Whildin
Pollyanna.....	Miss Hicks
The King of the Golden River.....	Miss Deem
Swedish Fairy Tales.....	Miss Atkins

FINANCES.

Statement by the disbursing agent of receipts and expenses for the fiscal year ending June 30, 1920.

	Receipts.	Expenses.		Receipts.	Expenses.
COMMISSARY STORES.			FARM. ¹		
Salaries.....		\$571.00	Salaries.....		\$3,197.80
Supplies.....		167.27	Supplies.....	\$1.73	1,049.68
Equipment.....		.75	Feed.....	32.41	5,977.34
Merchandise.....		13,244.47	Plants and seeds.....		274.35
Sundries.....	\$85.12	2.34	Equipment.....	20.00	146.35
Total.....	85.12	13,985.83	Live stock.....	586.10	411.00
			Care of live stock.....		126.38
			Sundries.....	64.57	28.11

¹ The account for the year of the farm in its relation with the other parts of the institution was as follows:

DEBITS.

Board and laundry of farm hands.....	\$408.00
Repairs.....	721.67
Sundries.....	20.48
Total.....	1,150.15

CREDITS.

Milk.....	\$3,343.28
Board of horses.....	336.00
Fruits and vegetables.....	295.88
Live stock.....	424.41
Poultry and eggs.....	1,396.30
Sundries.....	40.24
Total.....	8,836.09
Total debits.....	8,836.09
Total credits.....	1,150.15
Credit balance.....	7,685.94

NOTE.—The following item was included in the financial statement for the fiscal year ending June 30, 1919, and is not included in the above statement:

\$1,279.65 expended Aug. 6, 1919, on account of the 1918-19 appropriation.

The sum of \$6,500 which was appropriated in the deficiency bill of June 5, 1920, and was received June 22, 1920, is included in the receipts as given above; as it will be expended after July 1, 1920, it is not included in the expenses as given above, but will be included in the expenses of the financial statement for the fiscal year ending June 30, 1921.

Statement by the disbursing agent of receipts and expenses for the fiscal year ending June 30, 1920—Continued.

	Receipts.	Expenses.		Receipts.	Expenses.
FARMS—continued.			GALLAUDET COLLEGE.		
Repairs.....		\$188.78	Salaries.....	\$2.50	\$33,663.60
Milk.....	\$2,042.72		Supplies.....	17.23	983.89
Board of horses.....	4.47		Food.....	12.28	9,456.80
Fruits and vegetables.....	14.53		Equipment.....	32.94	1,019.74
Poultry and eggs.....	528.66		Doctors and medicines.....	306.70	1,788.50
Total.....	3,295.19	11,399.79	Tuition.....	5,690.00	100.00
IMPROVEMENTS, RENEWALS, AND REPAIRS.			Sundries.....		387.63
Salaries.....		5,096.08	Library.....		352.17
Supplies.....	75.00	3,085.43	Laboratory.....	1.62	149.57
Equipment.....	.25	123.54	Printing plant.....	2,401.01	1,715.17
Sundries.....		3.83	Total.....	8,464.28	49,617.16
Contract.....	52.30	3,470.07	LAUNDRY.		
Total.....	127.55	12,378.95	Salaries.....		1,751.18
KENDALL SCHOOL.			Supplies.....		580.75
Salaries.....		10,602.35	Equipment.....		34.87
Supplies.....	.70	411.87	Sundries.....	20.53	9.86
Food.....		2,174.20	Total.....	20.53	2,376.66
Equipment.....	5.81	1,227.97	PARKING.		
Doctors and medicines.....	78.25	595.23	Salaries.....		4,117.76
Tuition.....	4,141.00		Supplies.....		519.40
Sundries.....		59.72	Equipment.....		101.45
Total.....	4,220.76	15,071.34	Sundries.....	325.65	77.17
NORMAL DEPARTMENT.			Contracts and teaming.....	9.50	145.00
Salaries.....		1,580.30	Board and care of horses.....		23.00
Sundries.....		4.60	Total.....	335.15	4,984.38
Total.....		1,583.90	SPECIAL REPAIRS.		
OFFICE AND ADMINISTRATION.			Salaries.....		661.93
Salaries.....		9,057.11	Supplies.....		258.56
Supplies.....	.30	28.59	Contracts.....		1,079.51
Equipment.....	50.85	124.41	Total.....		2,000.00
Sundries.....		33.20	MISCELLANEOUS.		
Communication service.....	186.19	887.97	Merchandise.....	853.14	692.37
Total.....	237.34	10,131.28	Sundries.....	191.46	202.52
HEAT, LIGHT, AND POWER.			Traveling.....	2.68	681.12
Salaries.....		3,478.10	United States appropriations.....	127,379.87	
Supplies.....		121.69	Total.....	128,427.15	1,576.01
Coal.....		6,507.67	Grand total.....		
Gas.....		1,074.88	RECAPITULATION OF RECEIPTS AND EXPENSES.		
Equipment.....		34.82	Salaries.....	2.50	75,087.63
Sundries.....		28.69	Supplies.....	144.40	33,577.75
Total.....		11,245.85	Equipment.....	572.40	4,015.07
AUTOMOBILES.			United States appropriations.....	127,379.87	
Salaries.....		701.33	Tuition.....	9,531.00	100.00
Supplies.....	1.25	382.69	Merchandise.....	938.26	13,099.11
Gasoline and oil.....	3.50	539.40	Sundries.....	6,549.44	13,542.87
Equipment.....	200.05	790.17	Total.....	145,417.87	139,392.43
Sundries.....		121.08	Total receipts.....	145,417.87	
Repairs.....		496.61	Total expenses.....		139,392.43
Total.....	204.80	3,031.28	Cash on hand July 1, 1919.....	1,483.63	
			Cash on hand June 30, 1920.....		7,509.07
			Grand total.....	146,901.50	146,901.05

Statement of the treasurer for the fiscal year ended June 30, 1920.

GENERAL FUND.

July 1, 1919:		
By balance.....		\$251. 01
By treasurer's check on the Home Savings Bank, refund of amount advanced Mar. 18, 1919, account of general expenses.....		300. 00
By 2 Chesapeake & Potomac Telephone Co. coupons, at \$25.....		50. 00
By 8 Chesapeake & Ohio Railway Co. coupons, at \$22.50.....		180. 00
By 2 Riggs Realty Co. coupons, at \$12.50.....		25. 00
By 4 United States Liberty bond coupons, at \$10.....		40. 00
By 6 months' interest to Dec. 31, 1919, on balance, Union Trust Co....		16. 06
By 6 months' interest to June 30, 1920, on balance, Union Trust Co. ..		18. 34
Dec. 31, 1920: To H. Ralph Burton, bookkeeping expenses, treasurer's office, to Dec. 31, 1919.....	\$50. 00	
Mar. 22, 1920: To American Surety Co. of New York, premium on bond of treasurer to Mar. 19, 1920.....	25. 00	
Apr. 12, 1920: To Union Trust Co., rent of safe deposit box to Apr. 6, 1921.....	4. 00	
June 30, 1920: To balance.....	801. 41	
	880. 41	880. 41

MANUAL LABOR FUND.

July 1, 1919:		
By balance.....		92. 90
By treasurer's check on the Home Savings Bank, refund of amount advanced Mar. 18, 1919, on account of salary of manual-training teacher.....		700. 00
By 8 Southern Railway Co. coupons, at \$25.....		200. 00
By 2 Chesapeake & Ohio Railway Co. coupons, at \$22.50.....		45. 00
June 30, 1920: To balance.....	\$1, 037. 90	
	1, 037. 90	1, 037. 90

MEMORIAL ART FUND.

July 1, 1919:		
By balance.....		120. 95
By 2 United States Liberty bond coupons.....		4. 25
By 2 Washington Railway & Electric Co. coupons, at \$10.....		20. 00
June 30, 1920: To balance.....	\$145. 20	
	145. 20	145. 20

Summary of balances June 30, 1920.

General fund.....	801. 41
Manual-labor fund.....	1, 037. 90
Memorial-art fund.....	145. 20
Total.....	1, 984. 51

PHYSICAL NEEDS.

Since the erection of the new women's dormitory, completed at about the time of the entrance of the United States in the war, it has been our endeavor to carry on the institution as economically as possible and still give the instruction required by our students and pupils. The time has come, however, when the question of new buildings, repairs, and improvements should be looked at from the larger standpoint of both present needs and future growth and plans made to meet these requirements.

In the near future the following new buildings should be provided for the institution:

1. An administration building to accommodate the present offices of the president, faculty, and disbursing agent, together with store-rooms, library, auditorium, and alumni rooms. All of these offices and rooms are now located in the college men's dormitory, some of them in unsuitable quarters. Such an administration building of the type of the new college women's dormitory, fireproof and modern in all respects, might well be erected to the memory of the founder of the college, Dr. Edward Miner Gallaudet, who was for more than half a century its president.

The alumni of the college department have already suggested such a building and though very limited in their means have pledged some \$10,000 toward its erection. The cost of this structure would be about \$100,000. Its erection would set free quarters for the accommodation of 20 or 30 more young men of the college and put off for years the necessity of an additional dormitory building for them.

- The second building needed is a dormitory for the Kendall School. The girls of this department are now housed in one of the old residences formerly occupied by the principal of the Kendall School. They might well be taken care of in the dormitory now used for the Kendall School boys, which is located close to the new dormitory for college women. Changes and repairs in the building would be necessary, but its convenient location in the neighborhood of the school building would make it desirable for the younger girls.

A new building for the Kendall School boys, fireproof and large enough to accommodate 40 children with a number of teachers and officers, should be built near the school building and within easy reach of the present heating and lighting main. Ground for such a building is available.

It should contain a dining room large enough to accommodate all the Kendall School children and a shop for the small boys, to be used instead of the present basement shop in the Kendall School building, which is almost entirely underground. Such a dormitory would cost about \$100,000.

3. Addition to the laboratory building. To provide more classrooms for the collegiate department and space for the housing of valuable botanical and mineralogical collections, an addition to the present laboratory building is needed, containing four or five large rooms with separate entrance. The cost of this building would probably amount to \$35,000.

4. Addition to power house. The present power house was planned to provide heat and light for the old group of main buildings and is already taxed well toward its capacity. Its storage space for coal is limited and not easy of approach by modern trucks. To provide for heat and light for additional buildings and storage room for larger quantities of coal to be delivered directly from trucks, changes in the present power plant as to boiler capacity and bins should be made. This would cost in the neighborhood of \$30,000.

Absolutely necessary repairs to old buildings have been made annually, but as many of these structures are from 40 to 50 years old, extensive improvements and changes are desirable in the near future.

The Kendall School boys' dormitory should be repaired and remodeled for use as a dormitory for Kendall School girls as noted above. Changes in plumbing, improvement in furnishing, and general repairs would cost about \$10,000.

College Hall, the dormitory for young men of the college, is in need of thorough repairing of interior woodwork and much painting and varnishing. Quarters for the printing office should be enlarged and, on the erection of a new administration building, additional furniture and equipment with necessary changes for dormitory use should be made. Twenty thousand dollars would cover the expense for improvements, equipment, and alterations.

Houses 2, 3, 7, 8, and the farmhouse should be wired for electricity so that the occupants may have this modern convenience in the near future. The sum of \$3,000 should provide for such changes.

The outside woodwork of houses 1, 2, 3, and 4, which date back 40 or more years, is much in need of thorough repairing. This will include blinds, porches, cornices, and window sills. Probably \$12,000 would cover these repairs.

In the same houses the sum of \$3,000 should be expended for new cement floors in the basements.

The farmhouse is one of the oldest buildings now used by our institution. It was originally erected by Amos Kendall considerably over half a century ago. It should be remodeled and provided with additional rooms for farm help and with all modern conveniences. The expense of this work would be at least \$5,000.

Besides new buildings and repairs to old buildings, there is much to be done in connection with the improvement of the grounds of the institution. On West Virginia Avenue there is need for something over half a mile of fencing. At the present time a good post and wire fence would be all that is necessary. This with necessary clearing and draining along this boundary should not cost more than \$2,000.

The roadways within the institution grounds consist partly of gravel, partly of concrete, and partly of asphalt. There is over half a mile of asphalt roadway varying from 12 to 14 feet in width and not provided with curbing or gutters. All of this should be resurfaced and improved by vitrified brick gutter and stone or concrete curbing. This improvement would probably cost \$20,000.

The two roadways which lead from the front part of the grounds to the farm should be resurfaced and at least one of them carefully graded and macadamized. This could probably be done for \$2,000.

Cement walks in the neighborhood of College Hall and houses 2, 3, 4, 5, 6, 7, and 8, to the total approximate length of 600 feet, should be built. This should not cost more than \$1,000.

The lawns and driveways of the front part of the institution grounds were laid out many years ago by Mr. F. L. Olmstead, the noted landscape architect. These plans were followed to a large extent, but the erection of new buildings, the planting of class trees and new shrubbery, together with the enlargement of the area used for building purposes, make it desirable to have in the near future a resurvey of the portion of the grounds fronting on Florida Avenue and extending as far east as Eighth Street, with a view of making changes in the arrangement of shrubbery, taking care of the planting of new trees, extension of walks, driveways, etc. Such plans could be carried out for a modest sum.

The total of all these sums is \$343,000, but when it is considered that the present plant could not be duplicated for less than a million dollars and that buildings and changes mentioned would provide for the physical needs of our institution for many years to come, it would seem reasonable to start a program of building and repairing which would provide in the course of the next few years for all of these improvements.

ESTIMATES FOR THE FISCAL YEAR ENDING JUNE 30, 1922.

The following estimates for the fiscal year to end June 30, 1922, have already been submitted:

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, \$125,250.

For repairs to the buildings of the institution, including plumbing and steamfitting, and for repairs to pavements within the grounds, \$10,000.

For the purchase of 6.2 acres of land between Mount Olivet Road, West Virginia Avenue, and the northeast boundary of the grounds of the institution, at present belonging to Richard E. Pairo, \$12,000.

For the purchase of an automobile truck, \$2,500.

For clearing and draining land along boundary of institution grounds adjacent to West Virginia Avenue and for the erection of a boundary fence, \$2,000.

For a tile drainage system on the farm grounds of the institution, \$2,500.

For the installation of refrigerating plant, \$7,000.

It will be noted that an increase of \$15,000 has been asked for current expenses. Practically this whole additional amount is absolutely necessary in order to place the salaries of the employees of the institution on the proper basis.

Under the ruling of the Comptroller of the Treasury, our employees are not entitled to the bonuses which have been granted to Federal employees.

It has been possible, through small increases made in appropriations recently and through the most rigid economy in management, to increase somewhat the salaries paid to the institution force. At the same time, however, prices of all materials and supplies, such as coal, food, lumber, etc., bought by the institution have increased. Last year the number of pupils and students was increased by 17 per cent, so that it has not been possible to make the increases in salaries that are reasonable and just in consideration of the increased cost of living.

Teachers in the public schools of the District have lately received substantial raises, and it is being recognized that all persons engaged in education throughout the country are deserving of much higher compensation than they have received in recent years.

Our own work is a special one requiring particular skill. It is difficult to obtain officers and employees for our institution at any time, and unless marked increases are made in wages and salaries paid, either the usefulness of the institution must be greatly impaired or employees must make sacrifices as to living standards, which they should not be called upon to do.

Ten years ago the amount appropriated for current expenses was \$77,000. During that period maintenance costs generally have doubled and the increase in the number of pupils and students has been 40 per cent. The increase in appropriations asked for current expenses, therefore, is just, reasonable, and necessary.

In a plant consisting of 24 buildings, with grounds extending over 100 acres, with lawn, extensive driveways, walks, the value of buildings alone amounting to at least \$600,000, the amount granted for repairs should be a minimum of \$10,000. This sum can hardly do the work of the \$5,000 granted 10 years ago, when our buildings were then 10 years further away from the end of their periods of usefulness.

Twelve thousand dollars is asked for the purchase of 6.2 acres of land adjoining our institution grounds on the northeast. This tract is likely to be subdivided and built upon at an early date. Its acquisition by our institution would carry our boundaries to Mount Olivet Road and West Virginia Avenue, making it impossible for undesirable or unsightly buildings to be placed next to our own institution. This land could also be made of great value to our present farm grounds, which are hardly adequate to maintain our dairy herd.

The sum of \$2,500 is asked for the purchase of a small automobile truck, which is badly needed for the hauling of refuse, ashes, and other material from our plant, and for the purpose of delivering supplies from the city and country to our shop, storeroom, and power house.

For a number of years there has been no fence on the eastern boundary of the institution, now West Virginia Avenue. There has always been considerable wet land along this boundary partly grown up with brush. This land could be cleared and drained and a simple post and wire fence of good quality could be provided for \$2,000.

Our farm land has been carefully worked by our farm manager for a number of years past and the soil greatly improved by the proper rotation of crops and by the use of fertilizer produced by the dairy herd. It has also been made more productive by the plowing in of crops which have increased the humus and by the use of clover, cowpeas, and other nitrogen gatherers.

It has been impossible, however, under present conditions to prevent the washing of the soil or to make use of a number of low-lying spaces. A tile drainage system is greatly needed to take care of this condition and to make our farm land more productive. The main part of this work could be done for the \$2,500 asked for.

The cost of ice has mounted steadily in the past few years until it would seem an economy to install our own cooling and ice-manufacturing plant. This could be done for the sum of \$7,000.

CONFERENCE OF SUPERINTENDENTS AND PRINCIPALS.

During the early part of December, 1919, the Conference of Superintendents and Principals of American Schools for the Deaf met at the Ohio State School at Columbus. An interesting program was prepared, covering four days. Special consideration was given to the question of salaries of teachers. It was the unanimous opinion that these should be increased greatly in order to attract and retain capable teachers.

A committee was appointed to act with committees from other associations interested in the education of the deaf to obtain a general survey of schools for the deaf in this country through the assistance of one of our large foundations.

A report on standardization of schools for the deaf was submitted by a committee of the conference and there was considerable discussion of mentality and educational tests for deaf children in order to determine efficiency of school work. The results of several thousand tests given to deaf children were brought out by Dr. Pintner, of the Ohio State University. The president of the institution presented a paper on Gallaudet College explaining its requirements and its relations with the schools.

JOINT MEETING.

A joint meeting of the Convention of American Instructors of the Deaf, the American Association to Promote the Teaching of Speech to the Deaf, and the Society of Progressive Oral Advocates was held at Mount Airy, Philadelphia, June 28 to July 3, 1920, inclusive, on the occasion of the one hundredth anniversary of the foundation of the Pennsylvania Institution for the Deaf and Dumb.

Eighteen of the teachers and officers of this institution attended the meeting.

A very interesting program was carried out, including demonstrations of classroom work, papers on various phases of the education of the deaf, lectures by specialists in psychology and child welfare.

One day was set aside particularly for the celebration of the one hundredth anniversary of the founding of the Mount Airy School. The president of the institution and Mr. F. H. Hughes, instructor in the college, were invited to take part in this special program, and a paper was also read by Mr. J. A. McIlvaine, of the class of 1893, a graduate of both the Mount Airy School and the college.

Papers on the general program were given on the Normal Work of the College by Miss Annie E. Jameson, on Preparation in English by Prof. H. E. Day, and on the Sign Language at Gallaudet College by Dr. J. B. Hotchkiss of our faculty. Mr. A. L. Roberts, principal of our Kendall School, also took part in the formal discussion of a paper on the Teaching of English in Schools for the Deaf.

The president of the institution was reelected president of the Convention of American Instructors of the Deaf, Prof. Day was appointed assistant secretary, and Mr. Irving S. Fustfeld of the college was elected by the executive committee of the Conference of Superintendents and Principals to be editor of the American Annals of the Deaf.

EXERCISES OF PRESENTATION DAY.

The fifty-sixth public anniversary of the collegiate department was held in the college chapel on Wednesday, May 5. Dr. J. Stanley Durkee, president of Howard University, offered the opening prayer.

Orations given by members of the graduating class were as follows:

"Salt," by Armand Stephen Courrage, of Louisiana.

"Child Labor," by Mary Belle Logan, of Oklahoma.

"Revival of American Taste in Interior Decoration," by Kelly Haygood Stevens, of Texas.

Candidates for degrees were presented by President Hall, Vice President Fay, and Dr. Ely, as follows:

For the degree of master of science.

Isaac Goldberg, B. S., 1888, Gallaudet.

For the degree of master of arts.

Charles D. Seaton, B. A., 1893, Gallaudet.

Henry Jeremiah Pulver, B. A., 1917, Gallaudet.

For the degree of bachelor of pedagogy.

Olive Aida Whildin, B. A., 1919, Goucher College.

For the degree of bachelor of arts.

Miriam Caroline Flenner.

Wendell Haley.

Mary Belle Logan.

Eunice Dorothea Post.

Emily Ellen Sterck.

Kelly Haygood Stevens.

Walter Pittman Valiant.

For the degree of bachelor of science.

George Henry Davies.

George Hall Whitworth.

Powell Jones Wilson.

For the degree of bachelor of philosophy.

Harry Vern Barnett.

Armand Stephen Courrege.

Normal department certificate of graduation.

Jerome Hicks, Randolph-Macon Institute.

Hon. Leslie M. Shaw, ex-governor of Iowa and ex-Secretary of the Treasury, delivered a very interesting address to the graduating class and friends of the college.

The benediction was pronounced by Rev. Oliver J. Whildin, Episcopal minister to the deaf, Baltimore.

CONFERRING OF DEGREES.

On the closing day of the term, June 23, 1920, degrees and certificates were conferred in accordance with the recommendations of presentation day.

The honorary degree of master of arts was conferred upon Mr. Jonathan Holbrook Eddy, a deaf teacher of wide experience and high character, for many years connected with the Arkansas Deaf-Mute Institute, and upon Mr. Isaac B. Gardner, principal of the New York Institution for the Deaf, who has given many years of service to the work of educating deaf children and is now chairman of the Conference of Superintendents and Principals of American Schools for the Deaf.

All of which is respectfully submitted.

PERCIVAL HALL,
President.

The SECRETARY OF THE INTERIOR,
Washington, D. C.

APPENDIX A.

CATALOGUE OF STUDENTS AND PUPILS, BY STATES, 1919-20.

IN THE COLLEGE.

Alabama:

Franke, Emma.
Harrell, Josephine.
Rollings, Ollie.

Arizona:

Bible, Lenore.

California:

Benedict, Edwin.
Guire, Oscar.
Valiant, Walter.
Whitworth, George.

Colorado:

Barnett, Vern.
Frewing, Robert.
Teitelbaum, Bernie.
Wilson, Powell.

Connecticut:

Baldwin, Clarence.
Bouchard, Joseph.
Lewis, Florence.
Santin, Mario.

District of Columbia:

Werdig, Robert.

Florida:

Jones, Uriel.
Randall, Laurence.
Wilson, Lalla.

Illinois:

Cherry, Ladislaw.
Cohen, Jacob.

Iowa:

Marty, John.
Rebal, Frank.

Kansas:

Lahn, Nathan.
Linton, Pearl.
Paxton, Lawrence.

Kentucky:

Aronovitz, Louis.
Kannapell, Gordon.
Kannapell, Robert.
Tuck, Sara.

Louisiana:

Courrege, Armand.

Maryland:

Baynes, Harry.
Daley, Alma.
Downes, Noah.
Moss, Elizabeth.
Moss, Helen.

Massachusetts:

Oohen, Blume.

Michigan:

Maczkowski, Earl.

Minnesota:

Earsley, Etta.
Lauritsen, Wesley.
Lauritzen, Thomas.
Lindholm, Toivo.
Post, Eunice.
Rosen, Alex.
Werner, Maurice.

Mississippi:

Gotthelf, John.
Marshall, Maude.

Missouri:

Toner, Isabelle.

Montana:

O'Donnell, Arthur.

Nebraska:

Anderson, Edith.
Birk, Cecelia.
Jensen, Tilla.
Horn, Gertrude.
Kilcoyne, Catherine.
Lee, Fred.
Maxwell, Estella.
Netusil, Anton.

New Jersey:

Dobbins, Charles.
Higgins, Matthew.

New York:

Funk, John.
Herdtfelder, August.
Kirby, John.
Lewis, Gertrude.
May, William.
Orman, James.
Pusrin, Bella.

North Carolina:

Thomas, Carrie.

North Dakota:

Francis, Doris.
Haley, Wendell.

Ohio:

Durrant, Dorothy.
Glaser, Corinne.
La Fountain, Lewis.
McConnell, Eugene.
Pence, Helen.
Risley, Gladys.
Sattler, Madeline.
Toskey, Katherine.
Williams, Roger.

Oklahoma:

Griffing, Theodore.
Logan, Mary Belle.
Stephens, Alfred.

*Catalogue of Students and Pupils, by States, 1919-20—Continued.***IN THE COLLEGE—Continued.****Oregon:**

Dodd, Julia.

Pennsylvania:

Connor, Fred.

Davies, George.

Flenner, Miriam.

Harmon, Edward.

Harmon, Marion.

Hassett, Elizabeth.

Klaits, Mary.

Markel, Harland.

Miller, Gertrude.

Rogalsky, Samuel.

Schrager, Charles.

Starck, Emily.

Stilwell, Helen.

Zimble, Nathan.

South Carolina:

Boatwright, John.

Boatwright, Sophie.

Bradley, Isabelle.

Clarkson, Ella.

Edwards, Weinona.

Hartin, Archie.

Roper, La Reinie.

Smoak, Frank.

South Dakota:

Mills, Anson.

Sauvage, Esther.

Tennessee:

Lucado, Ida May.

Lucado, Prentis.

Rittenberg, Sam.

Texas:

Stevens, Kelly.

Washington:

Genner, Andrew.

McNeal, Edwin.

Robinson, Genevieve.

Seipp, John.

Wisconsin:

Bausch, Anna.

Bristol, Gordon.

Hansmann, Meta.

Langenberg, Ernest.

Weiss, Leonard.

Canada:

Creighton, Lucy.

McShane, Muriel.

Matthew, Gordon.

Nicholson, Ethelwynne.

Rosenroll, Richelda.

Stinson, Kathleen.

Total in the college..... 126

IN THE KENDALL SCHOOL.**Delaware:**

Ellingsworth, Ida.

Lynch, Edward.

Roberts, Pearl.

District of Columbia:

Anderson, Lillian.

Ball, Annie.

Berman, Frank.

Bostwick, Mabel.

Cicchino, Tony.

Cissel, Willie.

Clum, Marjorie.

Coe, William.

Covington, Alice.

Craven, Jack.

Crump, Edward.

Culverwell, Esther.

Curtis, Raymond.

De Grange, Arietta.

Dunn, Delma.

Glorius, Frances.

Higgins, Thelma.

Hill, Dorothy.

Hospital, Dixon.

Kleindienst, Maurice.

Lowe, Grace.

McCall, Rozelle.

Miller, Frances.

Miller, Mildred.

Miller, Thomas.

Minter, Lee.

Moore, Agnes.

Moore, Cecil.

District of Columbia—Continued.

Neitzey, Annie.

Norcia, Rosie.

Panholzer, Mary.

Pearson, Pearl.

Pucci, Luigi.

Rafferty, William.

Ramsay, William.

Reid, Florence.

Rodeheaver, Margaret.

Scott, Carlisle.

Sharp, Evelyn.

Sharp, William.

Stancilffe, Walton.

Wheeler, Clara.

Wortman, Robert.

Wuerdemann, Frank.

Zimmerman, Woodrow.

North Carolina:

Wolfe, Walker.

Ohio:

Krohngold, Walter.

Virginia:

Angel, Virginia.

De Ruchie, Harold.

Penn, John.

West Virginia:

Gollner, Catherine.

Smith, Kathleen.

Canada:

Isherwood, Sarah.

Paulson, Esther.

Young, John.

Total in the Kendall School..... 58

STUDENTS AND PUPILS ADMITTED, 1920-21.

IN THE COLLEGE.

California:

Sowell, Minnie.

Colorado:

Sandberg, Emma.

Connecticut:

Danofsky, Harry.

Dibble, Ione.

Skinner, Elliott.

Iowa:

Dobson, Mary.

Fritze, Geneva.

Kansas:

Ballance, Doris.

Ferguson, Stanley.

Hanis, Andrew.

Stewart, George.¹

Kentucky:

Suttka, Adeline.

Louisiana:

Leclerc, Sydney.

Maryland:

Peebles, Margaret.

Massachusetts:

Cohen, Rhoda.

Nebraska:

Bumann, Helena.

Falk, Charles.

Hawkins, Glenn.

Krohn, Albert.

McNeill, Lydia.

Makowski, Tillie.

Mason, Grace.

New Jersey:

Jackson, Margaret.

North Dakota:

Ackerman, Bertha.

Halvorson, Glenora.

Markstad, Mildred.

Ohio:

Fischer, Hazel.

Hogan, Edwin.

Turocke, Charles.

Pennsylvania:

Cusack, Hugh J.

Virginia:

Penn, John.*

Yaffey, Benjamin.

Wisconsin:

Bodden, Lucille.

Speich, Lillian.

Steinke, Kenneth.

Total..... 35

IN THE KENDALL SCHOOL.

District of Columbia:

Blaisdell, Edwin.

Clum, Marjorie.

Cooper, Merrill.

Dolan, James.²

Huffman, Neva.

Looney, Thomas.²Moore, Agnes.²Moore, Cecil.²

Moore, John.

Payne, Estelle.

District of Columbia—Continued.

Vorhees, Howard.

Watson, George.

Delaware:

Lynch, Hilda.

Lynch, Lemuel.

Philippine Islands:

Santos, Pedro.

West Virginia:

Smith, Kathleen.²

Total..... 16

¹ Readmitted to the preparatory class.² Readmitted.^{*} Transferred from Kendall School.

APPENDIX B.

FACULTY AND OFFICERS OF GALLAUDET COLLEGE, 1920-21.

- President and professor of applied mathematics and pedagogy.*—Percival Hall, M. A.
Litt. D.
Emeritus vice president and professor of languages.—Edward Allen Fay, M. A., Ph. D.,
Sc. D., Litt. D.
Vice president and professor of natural science.—Charles R. Ely, M. A., Ph. D.
Professor of English and history.—John Burton Hotchkiss, M. A., Litt. D.
Professor of English and biology.—Herbert E. Day, M. A.
Professor of mathematics and engineering.—Isaac Allison, E. E.
Professor of Latin and English.—Elizabeth Peet, B. A.
Assistant professor of Latin and natural science.—Victor O. Skyberg, M. A.
Instructor in mathematics and physical director.—Frederick H. Hughes, M. A.
Assistant professor of agriculture.—Harley D. Drake, B. A., M. S.
Emeritus instructor in drawing.—Arthur D. Bryant, B. Ph.
Instructor in English and history.—Irving S. Fustfeld, M. A.
Instructor in applied art and drawing, and in charge of college women.—Charlotte E.
Weiss.
Librarian and instructor in mathematics.—Edith Nelson, M. A.
Instructor in printing.—James Y. Johnson.
Instructor in domestic science.—Cornelia H. Rauch, B. A.
Registrar and secretary to the president.—Lois Herrington.

DEPARTMENT OF ARTICULATION AND NORMAL INSTRUCTION, 1920-21.

- In charge.*—Percival Hall., M. A., Litt. D.
Instructors.—Sarah Harvey Porter, M. A., Arthur L. Roberts, M. A., Grace Coleman, B. A.
Normal students.—Constance Hildreth, Drexel Institute; Mabel Whildin, Eastern High School, Baltimore.

FACULTY OF THE KENDALL SCHOOL, 1920-21.

- President.*—Percival Hall., M. A., Litt. D.
Principal.—Arthur L. Roberts, M. A.
Instructors.—Helen Fay, Grace Ely, Grace Coleman, B. A., Mary Deem, Ida Gaarder.
Instructor in sewing and cooking.—Agnes Suman.
Instructor in art and manual training.—Margaret E. Wafter.
Instructor in carpentry.—Norman Herrington.

DOMESTIC DEPARTMENT, 1920-21.

- Supervisor and disbursing agent.*—Louis L. Hooper, M. A.
Attending physician.—H. H. Donnally, M. D.
Dentist.—
Matron, Gallaudet College.—Mrs. Cora V. Troup.
Boys' matron, Kendall School.—Mrs. Arthur L. Roberts.
Girls' matron, Kendall School.—Miss Iona White.
Girls' supervisor.—Ruth Atkins.
Boys' supervisor.—James Young.
Master of Shop.—Norman Herrington.
Gardener.—Edward Mangum.
Farm manager.—Harley D. Drake, B. A., M. S.
Chief engineer.—William J. Muir.

APPENDIX C.

THE ACTS OF CONGRESS RELATING TO THE COLUMBIA INSTITUTION FOR THE DEAF.

[Act of February 16, 1857, 34th Cong., 3d sess. (11 Stat. L., 161-162).]

An Act To incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Byron Sunderland, J. C. McGuire, David A. Hall, and George W. Riggs, of Washington City, William Edes and Judson Mitchell, of Georgetown, and Amos Kendall and William Stickney, of the county of Washington, and such persons as may hereafter be associated with them, by contributions for the instruction of the deaf and dumb and the blind, are hereby created a body politic and corporate under the name of the "Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," to have perpetual succession and be capable to take, hold, and enjoy lands, tenements, hereditaments, and personal property, to use a common seal, and the same to alter at pleasure: *Provided,* That no real or personal property shall be held by said corporation except such as may be necessary to the maintenance and efficient management of said institution.

SEC. 2. *And be it further enacted,* That the institution shall be managed as provided for in its present constitution, and such additional regulations as may from time to time be found necessary; but as soon as sufficient contributions shall have been paid in to authorize an election according to the provisions of said constitution, the provisional officers therein named shall give notice of a general meeting to the contributors for the election of officers, and the officers elected at such general meeting shall hold their offices for one year and until their successors shall be elected as in said constitution provided: *Provided,* That said constitution may be altered in the manner therein provided, but not in such manner as to violate the Constitution or any law of the United States or of the District of Columbia.

SEC. 3. *And be it further enacted,* That it shall be the duty of the justices of the peace in the several wards of the cities of Washington and Georgetown and of the county of Washington to ascertain the names and residences of all deaf and dumb and blind persons within their respective wards and districts; who of them are of a teachable age, and also who of them are in indigent circumstances, and report the same to the president of the institution hereby incorporated.

SEC. 4. *And be it further enacted,* That whenever the Secretary of the Interior shall be satisfied by evidence produced by the president of the institution hereby incorporated, that any deaf and dumb or blind person of teachable age properly belonging to this District is in indigent circumstances and can not command the means to secure an education, it shall be his duty to authorize the said person to enter the said institution for instruction, and to pay for his maintenance and tuition therein at the rate of one hundred and fifty dollars per annum, for such deaf and dumb pupil, and at the rate of one hundred and fifty dollars per annum for such blind pupil, payable quarterly out of the Treasury of the United States.

SEC. 5. *And be it further enacted,* That it shall be lawful for said institution to receive and instruct deaf and dumb and blind persons from any of the States and Territories of the United States on such terms as may be agreed upon by themselves, their parents, guardians, or trustees, and the proper authorities of the said institution.

SEC. 6. *And be it further enacted,* That it shall be the duty of the president and directors of said institution to report to the Secretary of the Interior the condition of said institution on the first day of July in each year, embracing in said report the number of pupils of each description received and discharged during the preceding year, and the number remaining in the institution; also the branches of knowledge and industry taught and the progress made therein; also a statement showing the receipts of the institution and from what sources, and its disbursements and for what objects.

[Act of May 29, 1858, 35th Cong., 1st sess. (11 Stat. L., 293-294).]

An Act To amend the "Act to incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," approved February sixteenth, eighteen hundred and fifty-seven.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That in addition to the provision made in the above-recited act for the maintenance and tuition of pupils in the said institution the sum of three thousand dollars per annum, payable quarterly, shall be allowed for five years for the payment of salaries and incidental expenses of said institution, and that three thousand dollars be, and is hereby, appropriated for the present fiscal year, payable out of any moneys in the Treasury not otherwise appropriated.

SEC. 2. *And be it further enacted,* That the deaf and dumb and the blind children of all persons in the military or naval service of the United States, while such persons are actually in such service, shall be entitled to instruction in said institution, on the same terms as deaf and dumb and blind children belonging to the District of Columbia.

SEC. 3. *And be it further enacted,* That all receipts and disbursements under this act shall be reported to the Secretary of the Interior, as required in the sixth section of the act to which this is an amendment.

[Act of June 12, 1858, 35th Cong., 1st sess. (11 Stat. L., p. 321).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending the thirtieth of June, eighteen hundred and fifty-nine.

* * * * *

For salaries and incidental expenses of the institution for the instruction of the deaf, dumb, and blind in the District of Columbia, authorized by the act approved May twenty-nine, eighteen hundred and fifty-eight, three thousand dollars.

* * * * *

[Act of Mar. 3, 1859, 35th Cong., 2d sess. (11 Stat. L., p. 428).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending the thirtieth day of June, eighteen hundred and sixty.

* * * * *

For salaries and incidental expenses of the institution of the deaf, dumb, and blind in the District of Columbia, three thousand dollars.

* * * * *

[Act of June 13, 1860, 36th Cong., 1st sess. (12 Stat. L., 30-31).]

An Act To dissolve the "Washington's Manual Labor School and Male Orphan Asylum Society of the District of Columbia," and to authorize the transfer of its effects to the "Columbia Institution for the Instruction of the Deaf and Dumb and the Blind."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the trustees of "Washington's Manual Labor School and Male Orphan Asylum Society of the District of Columbia," incorporated by an act of Congress approved on the thirteenth day of June, eighteen hundred and forty-two, be, and they are hereby, authorized and empowered, by deed or other instrument in writing, to transfer all their funds and property of every description to the "Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," incorporated by an act of Congress approved February sixteen, eighteen hundred and fifty-seven, on such terms and conditions as may be agreed upon by said corporate bodies and incorporated in such deed or instrument of writing.

SEC. 2. *And be it further enacted,* That the said deed of transfer or instrument of writing shall be recorded in the recorder's office for land titles, in the county of Washington, and District of Columbia, and the terms and conditions of said deed shall be as obligatory upon said Columbia Institution as if they formed a part of its charter; and from the date of the record thereof, as aforesaid, the trustees of "Washington's Manual Labor School and Male Orphan Asylum Society" shall be forever thereafter absolved from their trust, and the act of June thirteen, eighteen hundred and forty-two, conferring upon them corporate powers and privileges, shall be thenceforward repealed: *Provided,* That all the debts and pecuniary liabilities of the said "Washington's Manual Labor School and Male Orphan Asylum" shall be transferred to, assumed by, and be debts of the said "Columbia Institution for the instruction of the Deaf and Dumb and the Blind," which shall be responsible therefor, and suits at law or in equity may be commenced against said last-mentioned corporation the same as if said debts had been originally incurred by it.

[Act of June 25, 1860, 36th Cong., 1st sess. (12 Stat. L., p. 109).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending the thirtieth of June, eighteen hundred and sixty-one.

Institution of the Deaf, Dumb, and Blind.—For salaries and incidental expenses of the Institution of the Deaf, Dumb, and Blind, in the District of Columbia, three thousand dollars.

[Act of Mar. 2, 1861, 36th Cong., 2d sess. (12 Stat. L., p. 217).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and sixty-two.

Institution of the Deaf, Dumb, and Blind.—For salaries and incidental expenses of the institution of the deaf, dumb, and blind, in the District of Columbia, three thousand dollars.

[Act of Mar. 15, 1862, 37th Congress, 2d sess. (12 Stat. L., 369-370).]

An Act To amend "An act to incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," and to make appropriations for the benefit thereof.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the sum of four thousand four hundred dollars per annum, payable quarterly, shall be allowed for the payment of salaries and incidental expenses of said institution; and that four thousand four hundred dollars be, and is hereby, appropriated, for that purpose, out of any moneys in the Treasury not otherwise appropriated, for the fiscal year ending June thirtieth, eighteen hundred and sixty-three.

Sec. 2. *And be it further enacted,* That the sum of nine thousand dollars be, and the same is hereby appropriated, out of any moneys in the Treasury not otherwise appropriated, for the erection, furnishing, and fitting up of two additions to the buildings of said institutions.

Sec. 3. *And be it further enacted,* That all receipts and disbursements under this act shall be reported to the Secretary of the Interior, as required in the sixth section of the act to which this is an amendment.

[Act of Mar. 3, 1863, 37th Cong., 3d sess. (12 Stat. L., p. 747).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and sixty-four, and for the year ending the 30th of June, 1863, and for other purposes.

Columbia Institution for the Deaf, and Dumb, and the Blind.—For salaries and incidental expenses of said institution, four thousand four hundred dollars.

For supplying the institution buildings with gas-making apparatus and fixtures, one thousand four hundred and seventy dollars.

For supplying the institution buildings with steam-heating apparatus, two thousand two hundred and fifty dollars.

[Act of Apr. 8, 1864, 38th Cong., 1st sess. (13 Stat. L., 45).]

An Act To authorize the Columbia Institution for the Deaf and Dumb and the Blind to confer degrees.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the board of directors of the Columbia Institution for the instruction of the deaf and dumb and the blind be, and they are hereby, authorized and empowered to grant and confer such degrees in the liberal arts and sciences to such pupils of the institution, or others, who, by their proficiency in learning or other meritorious distinction they shall think entitled to them, as are usually granted and conferred in colleges; and to grant to such graduates diplomas or certificates, sealed and signed in such manner as said board of directors may determine, to authenticate and perpetuate the memory of such graduation.

[Act of July 2, 1864, 38th Cong., 1st sess. (13 Stat. L., p. 349).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending the thirtieth of June, eighteen hundred and sixty-five, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb and the Blind.—For salaries and incidental expenses, embracing, in addition to the objects heretofore provided for in this appropriation, the salary of an additional teacher, construction of a new sewer, and the construction and repairs of fences, seven thousand five hundred dollars.

For continuing the work for the accommodation of the students and inmates in said institution, in addition to the appropriations heretofore made, viz: for the purchase of a tract of improved land, containing about thirteen acres, bordering on Boundary Street of the city of Washington, and adjoining the lot now belonging to the institution, to enable it to instruct the male pupils in horticulture and agriculture, and to furnish sites for mechanic shops and other necessary buildings, twenty-six thousand dollars: *Provided*, That before the purchase of the said thirteen acres is consummated, the owner shall complete the title in fee to the premises now held and occupied by said institution, by executing a release or conveyance of the remainders and reversions now outstanding in him to the said institution.

To bring the Potomac water into the institution from the nearest water mains, or other adequate sources in the city, three thousand two hundred dollars.

* * * * *

[Act of Feb. 23, 1865, 38th Cong., 2d sess. (13 Stat. L., 436).]

An Act To amend an act entitled "An act to incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," approved February sixteenth, eighteen hundred and fifty-seven.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That so much of said act as requires the teaching of the blind in said institution be, and the same is hereby, repealed, and the corporate name and style thereof shall hereafter be "The Columbia Institution for the Instruction of the Deaf and Dumb."

SEC. 2. *And be it further enacted*, That the Secretary of the Interior be, and he is hereby, authorized to cause all indigent blind children who are now, or may hereafter become entitled, under the law as it now exists, to instruction in said institution, to be instructed in some institution for the education of the blind, in Maryland, or some other State, at a cost not greater for each pupil than is, or may be for the time being, paid by such State, and to cause the same to be paid out of the Treasury of the United States.

SEC. 3. *And be it further enacted*, That this act shall take effect from and after the thirtieth day of June, eighteen hundred and sixty-five.

[Act of Apr. 7, 1866, 39th Cong., 1st sess. (14 Stat. L., p. 21).]

An Act Making additional appropriations and to supply the deficiencies in the appropriations for sundry civil expenses of the Government for the fiscal year ending the thirtieth of June, eighteen hundred and sixty-six, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For salaries and incidental expenses, including five hundred dollars for the purchase of books and illustrative apparatus, twelve thousand five hundred dollars.

For the erection, furnishing, and fitting up of the two extensions to the buildings, to provide enlarged accommodations for the male department, and to furnish rooms for the instruction of the pupils in useful labor, thirty-nine thousand four hundred and forty-five dollars and eighty-seven cents.

For the proper inclosure, grading, and improvement of the grounds of the institution, three thousand five hundred dollars.

* * * * *

[Act of July 28, 1866, 39th Cong., 1st sess. (14 Stat. L., p. 317).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and sixty-seven, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For the support of the institution, including five hundred dollars for books and illustrative apparatus, twenty thousand seven hundred dollars.

For the erection, furnishing, and fitting up of two extensions to the buildings, to provide enlarged accommodations for the male and female pupils and the resident officers of the institution, thirty-two thousand two hundred and forty dollars.

For the erection of a brick barn, carriage house, cow house, shop, gas house, and ice house, fourteen thousand five hundred dollars.

For the improvement and inclosure of the grounds of the institution, including underdrainage and sewerage, four thousand five hundred dollars.

* * * * *

[Act of Mar. 2, 1867, 39th Cong., 2d sess. (14 Stat. L., pp. 464-465).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and sixty-eight, and for other purposes.

* * * * *
Columbia Institution for the Deaf and Dumb.—For the support of the institution, including one thousand dollars for books and illustrative apparatus, twenty-five thousand dollars: *Provided*, That deaf-mutes, not exceeding ten in number, residing in the several States and Territories of the United States, applying for admission to the collegiate department of the institution shall be received on the same terms and conditions as those prescribed by law for residents of the District of Columbia, at the discretion of the president of the institution.

For the erection, furnishing, and fitting up of additions to the buildings of the institution, to provide enlarged accommodations for the male and female pupils and the resident officers of the institution, fifty-four thousand six hundred and seventy-five dollars.

For the enlargement and further improvement of the grounds of the institution, including underdrainage, seven thousand five hundred dollars.

To furnish an increased supply of Potomac water and for the erection of tanks to regulate the distribution thereof, five thousand dollars, to be expended under the direction of the president of the institution.

* * * * *
 [Act of July 27, 1868, 40th Cong., 2d sess. (15 Stat. L., 232-234).]

An Act Making appropriations for the service of the Columbia Institution for the Instruction of the Deaf and Dumb, and establishing additional regulations for the government of the institution, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the following sums be, and the same are hereby, appropriated, out of any moneys in the Treasury not otherwise appropriated, for the benefit of the Columbia Institution for the Instruction of the Deaf and Dumb:

For the support of the institution, in addition to the existing appropriation to meet the increased expense of maintaining pupils whose admission was authorized by an act of Congress approved March second, eighteen hundred and sixty-seven, three thousand dollars.

For continuing the work upon buildings of the institution in accordance with the plans heretofore submitted to Congress, forty-eight thousand dollars.

SEC. 2. *And be it further enacted*, That in addition to the directors whose appointment has heretofore been provided for by law, there shall be three other directors appointed in the following manner: One Senator by the President of the Senate, and two Representatives by the Speaker of the House; these directors to hold their offices for the term of a single Congress, and to be eligible to a reappointment.

SEC. 3. *And be it further enacted*, That no part of the real or personal property now held or hereafter to be acquired by said institution shall be devoted to any other purpose than the education of the deaf and dumb, nor shall any portion of the real estate be aliened, sold, or conveyed, except under the authority of a special act of Congress.

SEC. 4. *And be it further enacted*, That so much of the act of February sixteenth, eighteen hundred and fifty-seven, as allows the payment of one hundred and fifty dollars per annum for the maintenance and tuition of each pupil admitted by order of the Secretary of the Interior be, and the same is hereby, repealed.

SEC. 5. *And be it further enacted*, That the number of students in the collegiate department from the several States, as authorized by the act of March second, eighteen hundred and sixty-seven, shall be increased from ten to twenty-five in number.

SEC. 6. *And be it further enacted*, That the following sums be, and the same are hereby, appropriated, for the purposes hereinafter expressed, for the fiscal year ending June thirtieth, eighteen hundred and sixty-nine.

* * * * *
Columbia Institution for the Deaf and Dumb.—For the support of the institution, including one thousand dollars for books and illustrative apparatus, twelve thousand and five hundred dollars.

For the proper inclosure, improvement, and enlargement of the grounds of the institution, in accordance with plans heretofore submitted to Congress, three thousand six hundred dollars. * * *

SEC. 7. *And be it further enacted*, That the superintendent of the said Columbia Institution for the Deaf and Dumb shall, at the commencement of every December

session of Congress, make a full and complete statement of all the expenditures made by virtue of any appropriations by Congress. Said statement shall include the amount paid to said superintendent, and also for teachers, to whom paid, and the rate at which paid.

* * * * *

[Act of Mar. 3, 1869, 40th Cong., 3d sess. (15 Stat. L., p. 310).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and seventy, and for other purposes.

* * * * *

To enable the Secretary of the Interior to provide for the proper maintenance and tuition of the beneficiaries of the United States in the Columbia institution for the Deaf and Dumb, for the year ending June thirtieth, eighteen hundred and sixty-nine, seventeen thousand five hundred dollars.

For the maintenance and tuition of the same, for the year ending June thirtieth, eighteen hundred and seventy, thirty thousand dollars.

* * * * *

[Act of July 15, 1870, 41st Cong., 2d sess. (16 Stat. L., p. 294).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and seventy-one, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and the maintenance of the beneficiaries of the United States, forty thousand seven hundred and seventy-five dollars: *Provided*, That the number of students in the collegiate department from the several States authorized by the acts of March two, eighteen hundred and sixty-seven, and July twenty-seven, eighteen hundred and sixty-eight, may be increased to forty; but no student now at said institution, coming from said States under said acts, shall be supported therein by the United States, from and after the thirtieth day of June, eighteen hundred and seventy-one, and no student hereafter coming to said institution from either of said States under said acts and this act shall be supported by the United States during any portion of the time he remains therein.

For completion of the main central building, ninety-four thousand and eighty-seven dollars.

* * * * *

[Act of Mar. 3, 1871, 41st Cong., 3d sess. (16 Stat. L., p. 500).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-two, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For the supply of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty thousand five hundred dollars.

For continuing the work on the inclosure and improving and grading the grounds of the institution, six thousand dollars.

For necessary expenses in the erection, furnishing, and fitting up of the buildings of the institution, in accordance with plans heretofore submitted to Congress, eighteen thousand dollars.

* * * * *

[Act of May 18, 1872, 42d Cong., 2d sess. (17 Stat. L., p. 131).]

An Act Making appropriations to supply deficiencies in the appropriations for the service of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-two, and for former years, and for other purposes.

* * * * *

Public works.—Columbia Institute for the Deaf and Dumb: For furnishing and fitting up the buildings of the institution, six thousand dollars.

For repairs of buildings of said institute during fiscal year ending June thirtieth, eighteen hundred and seventy-two, three thousand five hundred dollars.

* * * * *

[Act of June 10, 1872, 42d Cong., 2d sess. (17 Stat. L., p. 360).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-three, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty-eight thousand dollars.

For continuing the work on the inclosure, improvement, and grading of the grounds of the institution, six thousand dollars.

To provide for payments due and unpaid on July first, eighteen hundred and seventy-two, on the purchase by the institution of the estate known as Kendall Green, seventy thousand dollars: *Provided*, That before the expenditure of any part of this appropriation, by proper deeds of conveyance, to be approved by the Attorney General of the United States, all the real estate now owned by the said Columbia Institution for the Deaf and Dumb shall be vested in the United States, as trustees, for the sole use and purpose provided in the act entitled "An act to incorporate the Columbia Institution for the Instruction of the Deaf, Dumb, and Blind," approved February sixteenth, eighteen hundred and fifty-seven, and the several acts amendatory thereof: *Provided*, That, whenever Congress shall so determine, any part of said estate may be sold, and so much of the proceeds thereof as shall be needful for the purpose shall be applied to reimburse the United States for the expenditure herein provided.

* * * * *

[Act of Mar. 3, 1873, 42d Cong., 3d sess. (17 Stat. L., p. 518).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-four, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty-eight thousand dollars.

* * * * *

[Act of June 22, 1874, 43d Cong., 1st sess. (18 Stat. L., p. 143).]

An Act Making appropriations to supply deficiencies in appropriations for the service of the Government for the fiscal years ending June thirtieth, eighteen hundred and seventy-three and eighteen hundred and seventy-four, and for other purposes.

* * * * *

For the Columbia Institution for the Deaf and Dumb in the District of Columbia, to enable the trustees of the institution to pay the amount yet due on the purchase of the estate known as Kendall Green, ten thousand six hundred and ninety-seven dollars and forty-six cents, to be expended under the direction of the Secretary of the Interior.

* * * * *

[Act of June 23, 1874, 43d Cong., 1st sess. (18 Stat. L., p. 215).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-five, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty-eight thousand dollars.

For continuing the work on the erection and fitting up the buildings of the institution, in accordance with plans heretofore submitted to Congress, twenty-nine thousand dollars.

* * * * *

[Act of Mar. 3, 1875, 43d Cong., 2d sess. (18 Stat. L., p. 386).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-six, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty-eight thousand dollars.

For continuing the work on the erection, furnishing, and fitting up the buildings of the institution, in accordance with the plans submitted to Congress, forty thousand dollars.

* * * * *

[Act of July 31, 1876, 44th Cong., 1st sess. (19 Stat. L., p. 108).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-seven, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for books and illustrative apparatus, forty-eight thousand dollars.

For continuing the work on the erection, furnishing, and fitting up the buildings of the institution, in accordance with plans heretofore submitted, and for repairs on buildings already completed, forty thousand dollars.

* * * * *

[Revised Statutes of the United States, second edition, chap. 5, pp. 941, 942.]

THE COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

SEC. 4859. The corporation created by the act of February sixteenth, eighteen hundred and fifty-seven, under the name of the "Columbia Institution for the Instruction of the Deaf and Dumb," shall have perpetual succession, and be capable to take, hold, and enjoy lands, tenements, hereditaments, and personal property, to use a common seal, and to alter the same at pleasure. But no real or personal property shall be held by the corporation, except such as may be necessary to the maintenance and efficient management of the institution.

SEC. 4860. The terms and conditions of the deed of transfer of the funds and property of Washington's Manual-Labor School and Male Orphan Asylum Society of the District of Columbia shall be as obligatory upon the Columbia Institution for the Instruction of the Deaf and Dumb as if they formed a part of its charter.

SEC. 4861. No part of the real or personal property now held or hereafter acquired by the Columbia Institution for the Instruction of the Deaf and Dumb shall be devoted to any other purpose than the education of the deaf and dumb, nor shall any portion of the real estate be aliened, sold, or conveyed, except under the authority of a special act of Congress.

SEC. 4862. The Columbia Institution for the Instruction of the Deaf and Dumb shall be managed as provided for in its present constitution and such additional regulations as may from time to time be found necessary; but as soon as sufficient contributions shall have been paid in to authorize an election according to the provisions of the constitution the provisional officers therein named shall give notice of a general meeting to the contributors for the election of officers, and the officers elected at such general meeting shall hold their offices for one year and until their successors shall be elected as in the constitution provided, and the constitution may be altered consistently with law in the manner therein provided.

SEC. 4863. In addition to the directors whose appointment has heretofore been provided for by law there shall be three other directors of the Columbia Institution for the Instruction of the Deaf and Dumb appointed in the following manner: One Senator by the President of the Senate and two Representatives by the Speaker of the House. These directors shall hold their offices for the term of a single Congress and be eligible to a reappointment.

SEC. 4864. Whenever the Secretary of the Interior is satisfied by evidence produced by the president of the Columbia Institution for the Instruction of the Deaf and Dumb that any deaf and dumb person of teachable age, properly belonging to the District of Columbia, is in indigent circumstances and can not command the means to secure an education, it shall be his duty to authorize such person to enter the institution for instruction.

SEC. 4865. Deaf mutes, not exceeding forty in number, residing in the several States and Territories, applying for admission to the collegiate department of the Columbia Institution for the Instruction of the Deaf and Dumb, shall be received on the same terms and conditions as those prescribed by law for residents of the District of Columbia, at the discretion of the president of the institution; but no student coming from either of the States shall be supported by the United States during any portion of the time he remains therein.

SEC. 4866. It shall be the duty of the justices of the peace for the District of Columbia to ascertain the names and residences of all deaf and dumb persons within their respective districts; who of them are of teachable age, and also who of them are in indigent circumstances; and to report the same to the president of the Columbia Institution for the Instruction of the Deaf and Dumb.

SEC. 4867. The superintendent of the Columbia Institution for the Instruction of the Deaf and Dumb shall, at the commencement of every December session of Congress, make a full and complete statement of all the expenditures made by virtue of any appropriations by Congress, including the amounts and the rates paid to the superintendent, and for teachers.

SEC. 4868. It shall be the duty of the president and directors of the Columbia Institution for the Instruction of the Deaf and Dumb to report to the Secretary of the Interior the condition of the institution on the first day of July in each year, embracing in the report the number of pupils of each description received and discharged during the preceding year, and the number remaining in the institution; also the branches of knowledge and industry taught, and the progress made therein; also a statement showing the receipts of the institution, and from what sources, and its disbursements, and for what objects.

SEC. 4869. Whenever the Secretary of the Interior is satisfied, by evidence produced by the president of the Columbia Institution for the Instruction of the Deaf and Dumb, that any blind person of teachable age can not command the means to secure an education, he may cause such person to be instructed in some institution for the education of the blind, in Maryland, or some other State, at a cost not greater for each pupil than is, or may be for the time being, paid by such State, and to cause the same to be paid out of the Treasury of the United States.

[Act of Mar. 3, 1877, 44th Cong., 2d sess. (19 Stat. L., p. 347).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-eight, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For the support of the institution, including salaries and incidental expenses, the maintenance of the beneficiaries of the United States, and five hundred dollars for the books and illustrative apparatus, forty-eight thousand dollars. And the accounting officers of the Treasury are hereby authorized in the settlement of the accounts of the disbursing agent for the said institution, to give credit for voucher No. five in the first quarter of eighteen hundred and seventy-six, and for vouchers Nos. forty-one and fifty-eight in the second quarter of the same year; said vouchers being receipts for moneys paid for fuel for the use of said institution, if the said accounting officers shall find that said vouchers were for expenditures made for the benefit of said institution.

For the completion of the work on the erection, furnishing, and fitting up the buildings of the institution in accordance with plans heretofore submitted, and for repairs on buildings already completed, sixty-nine thousand five hundred and twenty-four dollars and sixty-two cents.

* * * * *

[Act of Dec. 15, 1877, 45th Cong., 2d sess. (20 Stat. L., p. 12).]

An Act To provide for deficiencies in the appropriations for the service of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-eight, and for prior years, and for other purposes.

* * * * *

For fitting up and furnishing the new buildings of the Columbia Institution for the Deaf and Dumb, being a deficiency for the fiscal year eighteen hundred and seventy-eight, twenty-five hundred dollars.

* * * * *

[Act of June 20, 1878, 45th Cong., 2d sess. (20 Stat. L., p. 231).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and seventy-nine, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses, Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and five hundred dollars for books and illustrative apparatus, fifty-one thousand dollars.

For furniture and repairs of fences and walks, five thousand dollars; which shall be immediately available.

* * * * *

[Act of Mar. 3, 1879, 45th Cong., 3d sess. (20 Stat. L., p. 395).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses, Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and five hundred dollars for books and illustrative apparatus, fifty thousand dollars.

* * * * *

[Act of June 16, 1880, 46th Cong., 2d sess. (21 Stat. L., pp. 275, 276).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-one, and for other purposes.

* * * * *

Current expenses, Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and five hundred dollars for books and illustrative apparatus and two thousand five hundred dollars for general repairs, fifty-three thousand five hundred dollars: *Provided*, That when any indigent applicant for admission to the institution belonging to the District of Columbia, and being of teachable age, is found, on examination by the president of the institution, to be of feeble mind, and hence incapable of receiving instruction among children of sound mind, the Secretary of the Interior may cause such person to be instructed in some institution for the education of feeble-minded children in Pennsylvania, or some other State, at a cost not greater for each pupil than is, or may be for the time being, paid by such State for similar instruction, and the sum necessary therefor is appropriated out of such sum above provided for current expenses of the institution.

For erection and fitting up of a gymnasium for the use of the students and pupils, five thousand dollars, and for the improvement and inclosure of the grounds of the institution, two thousand five hundred dollars; in all, seven thousand five hundred dollars.

* * * * *

[Act of Mar. 31, 1881, 46th Cong., 3d sess. (21 Stat. L., p. 452).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-two, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses, Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and five hundred dollars for books and illustrative apparatus, and two thousand five hundred dollars for general repairs, fifty-three thousand five hundred dollars.

Buildings and grounds, Columbia Institution for the Deaf and Dumb: For the completion and fitting up of the gymnasium, eight thousand two hundred and forty-two dollars and seven cents; for the erection of a farm barn, two thousand dollars; in all, ten thousand two hundred and forty-two dollars and seven cents.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

[Act of Aug. 7, 1882, 47th Cong., 1st sess. (22 Stat. L., p. 330).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-three, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For current expenses of the Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs, and improvements, fifty-five thousand dollars: *Provided*, That no more than twenty-two thousand dollars of said sum shall be expended for salaries and wages.

For buildings and grounds of the Columbia Institution for the Deaf and Dumb: For the completion of the farm barn, two thousand dollars: and for the inclosure and improvement of the grounds of the institution, one thousand five hundred dollars.

* * * * *

[Act of Mar. 3, 1883, 47th Cong., 2d sess. (22 Stat. L., pp. 625-626).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, eighteen hundred and eighty-four, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For current expenses of the Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs, and improvements, fifty-five thousand dollars: *Provided*, That no more than twenty-five thousand dollars of said sum shall be expended for salaries and wages: *Provided further*, Hereafter the report of said institution shall contain an itemized statement of all employees, the salaries or wages, respectively, each of them, and also of all other expenses of said institution.

For the improvement and inclosure of the grounds and repairs of buildings, three thousand dollars.

* * * * *

[Act of July 7, 1884, 48th Cong., 1st sess. (23 Stat. L., pp. 213-214).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-five, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For current expenses of the Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs, and improvements, fifty-five thousand dollars: *Provided*, That not more than twenty-five thousand dollars of said sum shall be expended for salaries and wages.

For the improvement and inclosure of the grounds and repairs of buildings, three thousand dollars.

* * * * *

[Act of July 7, 1884, 48th Cong., 1st sess. (23 Stat. L., p. 255).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and eighty-four, and for prior years, and for those certified as due by the accounting officers of the Treasury in accordance with section four of the act of June fourteenth, eighteen hundred and seventy-eight, heretofore paid from permanent appropriations, and for other purposes.

* * * * *

For current expenses, Columbia Institution for the Deaf and Dumb, eighteen hundred and eighty-one and prior years, thirty-nine cents.

* * * * *

[Act of Mar. 3, 1835, 48th Cong., 2d sess. (23 Stat. L., p. 501).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-six, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For current expenses of the Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs, and improvements, fifty-five thousand dollars: *Provided*, That no more than twenty-five thousand dollars of said sum shall be expended for salaries and wages.

For the extension of the buildings of the institution for the purpose of providing additional schoolroom accommodation, seventeen thousand dollars.

* * * * *

[Act of Aug. 4, 1836, 49th Cong., 1st sess. (24 Stat. L., pp. 241-242).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs and improvements, fifty-two thousand five hundred dollars: *Provided*, That no more than twenty-five thousand dollars of said sum shall be expended for salaries and wages.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia, as provided for in the act approved June sixteenth, eighteen hundred and eighty, two thousand five hundred dollars.

For the extension of the buildings of the institution for the purpose of providing additional schoolroom accommodation and also room for the instruction of the pupils in industrial labor, and for furnishing and fitting up said additional building, eight thousand dollars.

* * * * *

[Act of Mar. 3, 1837, 49th Cong., 2d sess. (24 Stat. L., p. 528).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-eight, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs and improvements, fifty-two thousand five hundred dollars: *Provided*, That no more than twenty-five thousand dollars of said sum shall be expended for salaries and wages.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia, as provided for in the act approved June sixteenth, eighteen hundred and eighty, two thousand five hundred dollars.

* * * * *

[Act of Feb. 1, 1838, 50th Cong., 1st sess. (25 Stat. L., p. 13).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for prior years, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For the support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, for general repairs and improvements, two thousand five hundred dollars.

* * * * *

[Act of Mar. 30, 1888, 50th Cong., 1st sess. (25 Stat. L., p. 54).]

An Act To provide for certain of the most urgent deficiencies in the appropriations for the service of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-eight, and for other purposes.

* * * * *

Current expenses, Columbia Institution for the Deaf and Dumb.—For current expenses for the year ending June thirtieth, eighteen hundred and eighty-eight, in addition to the amount already appropriated, two thousand five hundred dollars.

* * * * *

[Act of Oct. 2, 1888, 50th Cong., 1st sess. (25 Stat. L., pp. 527-528).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and eighty-nine, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, and for general repairs, and improvements, fifty-two thousand five hundred dollars: *Provided*, That no more than twenty-five thousand dollars of said sum shall be expended for salaries and wages.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia, as provided for in the act approved June sixteenth, eighteen hundred and eighty, two thousand five hundred dollars.

* * * * *

[Act of Mar. 2, 1889, 50th Cong., 2d sess. (25 Stat. L., p. 921).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and eighty-one, and for prior years and for other purposes.

* * * * *

Columbia Institute for the Deaf and Dumb.—For the support of the institution, including salaries and incidental expenses for books and illustrative apparatus, and for general repairs and improvements, two thousand five hundred dollars.

* * * * *

[Act of Mar. 2, 1889, 50th Cong., 2d sess. (25 Stat. L., pp. 961-962).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus, and for general repairs and improvements, fifty-five thousand dollars: *Provided*, That of the above sum no more shall be expended for salaries and wages in this institution during the fiscal year eighteen hundred and ninety than shall, with the payments from other sources, make a total for such salaries and wages for said year of twenty-eight thousand dollars in all: *Provided further*, That one-half of all expenses attending the instruction of deaf and dumb persons admitted to said institution from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, shall be paid from the revenues of the District of Columbia and one-half out of the Treasury of the United States, and hereafter estimates for such expenses shall each year be submitted in the regular estimates for the expenses of the government of the District of Columbia: *And provided further*, That deaf-mutes, not exceeding sixty in number, admitted to this institution from the several States and Territories, as provided in section forty-eight hundred and sixty-five of the Revised Statutes, shall only have the expenses of their instruction in the collegiate department, exclusive of support, paid from appropriations made for the support of the institution.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia, as provided for in the act approved June sixteenth, eighteen hundred and eighty, two thousand five hundred dollars, one-half of this sum to be paid out of the revenues of the District of Columbia and one-half out of the Treasury of the United States.

* * * * *

[Act of Aug. 6, 1890, 51st Cong., 1st sess. (26 Stat. L., p. 308).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-one, and for other purposes.

* * * * *

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars.

* * * * *

[Act of Aug. 30, 1890, 51st Cong., 1st sess. (26 Stat. L., pp. 392-393).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-one, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, and for books and illustrative apparatus and for general repairs and improvements, forty-seven thousand five hundred dollars.

Provided, That deaf-mutes, not exceeding sixty in number, admitted to this institution from the several States and Territories under section forty-eight hundred and sixty-five of the Revised Statutes shall have the expenses of their instruction in the collegiate department paid from this appropriation, together with so much of the expense of their support when indigent and while in the institution as may be authorized by the board of trustees, with the approval of the Secretary of the Interior; and hereafter there shall not be admitted to said institution under section forty-eight hundred and sixty-five of the Revised Statutes, nor shall there be maintained after such admission, at any one time from any State or Territory exceeding three deaf-mutes while there are applications pending from deaf-mutes, citizens of States or Territories having less than three pupils in said institution: *Provided further*, That hereafter there shall be included in the annual Book of Estimates a statement showing the number of persons employed each year in this institution and the compensation paid to each.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia as provided for in the act approved June sixteenth, eighteen hundred and eighty, three thousand four hundred dollars. One-half of this sum shall be paid out of the revenues of the District of Columbia and one-half out of the Treasury of the United States, and hereafter the estimates for this expense shall each year be submitted in the annual estimates for the expenses of the government of the District of Columbia.

* * * * *

[Act of Sept. 30, 1890, 51st Cong., 1st sess. (26 Stat. L., p. 522).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and ninety, and for prior years, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For salaries and wages, in addition to the amount already allowed, two thousand five hundred and thirty-one dollars and ninety-nine cents.

* * * * *

[Act of Mar. 3, 1891, 51st Cong., 2d sess. (26 Stat. L., p. 973).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-two, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus and for general repairs and improvements, fifty thousand five hundred

dollars, three thousand dollars of which to be expended in the employment of instructors of articulation.

* * * * *

[Act of Mar. 3, 1891, 51st Cong., 2d sess. (26 Stat. L., p. 1077).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-two, and for other purposes.

* * * * *

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object, beginning with the current fiscal year, shall be accounted for through the Department of the Interior.

To enable the Secretary of the Interior to provide for the education of feeble-minded children belonging to the District of Columbia as provided for in the act approved June sixteenth, eighteen hundred and eighty, three thousand four hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of July 14, 1892, 52d Cong., 1st sess. (27 Stat. L., p. 184).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-three, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of Aug. 5, 1892, 52d Cong., 1st sess. (27 Stat. L., p. 372).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-three, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty thousand five hundred dollars, three thousand dollars of which to be expended in the employment of instructors of articulation.

For buildings and grounds as follows:

For inclosure, care, and improvement of grounds, and for repairs of buildings, including repairs of heating apparatus, plumbing, and sewerage, two thousand dollars.

* * * * *

[Act of Mar. 3, 1893, 52d Cong., 2d sess. (27 Stat. L., p. 551).]

An Act Making appropriations for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-four, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of Mar. 3, 1893, 52d Cong., 2d sess. (27 Stat. L., p. 596).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-four, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-two thousand five hundred dollars, three thousand dollars of which to be expended in the employment of instructors of articulation.

For completion of inclosure of grounds, one thousand dollars.

* * * * *

[Act of Aug. 7, 1894, 53d Cong., 2d sess. (28 Stat. L., p. 259).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-five, and for other purposes.

* * * * *

For instruction of the deaf and dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of Aug. 18, 1894, 53d Cong., 2d sess. (28 Stat. L., p. 399).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-five, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-two thousand five hundred dollars.

For special repairs to the buildings and to complete the inclosure of the grounds, one thousand dollars.

* * * * *

[Act of Mar. 2, 1895, 53d Cong., 3d sess. (28 Stat. L., p. 761).]

An Act Making appropriations to provide for expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-six, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of Mar. 3, 1895, 53d Cong., 3d sess. (28 Stat. L., p. 941).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-six, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb: For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-two thousand five hundred dollars.

For special repairs to the buildings and for the improvement of the grounds, one thousand dollars.

For additional building, complete, thirty thousand dollars.

* * * * *

[Act of June 11, 1896, 54th Cong., 1st sess. (29 Stat. L., p. 409).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-seven, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of June 11, 1896, 54th Cong., 1st sess. (29 Stat. L., p. 437).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-seven, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-four thousand five hundred dollars.

For repairs to the buildings of the institution and for the furnishing of the new buildings provided for by act approved March second, eighteen hundred and ninety-five, three thousand dollars.

* * * * *

[Act of Jan. 26, 1897, 54th Cong., 2d sess. (29 Stat. L., 499).]

An Act To incorporate the Convention of American Instructors of the Deaf.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Edward M. Gallaudet, of Washington, in the District of Columbia; Francis D. Clarke, of Flint, in the State of Michigan; S. Tefft Walker, of Jacksonville, in the State of Illinois; James L. Smith, of Faribault, in the State of Minnesota; Sarah Fuller, of Boston, in the State of Massachusetts; David C. Dudley, of Colorado Springs, in the State of Colorado, and John R. Dobyns, of Jackson, in the State of Mississippi, officers and members of the Convention of American Instructors of the Deaf, and their associates and successors be, and they are hereby, incorporated and made a body politic and corporate in the District of Columbia by the name of the "Convention of American Instructors of the Deaf," for the promotion of the education of the deaf on the broadest, most advanced, and practical lines; and by that name it may sue and be sued, plead and be impleaded in any court of law or equity, and may have and use a common seal and change the same at pleasure.

SEC. 2. That the said corporation shall have the power to take and hold personal estate and such real estate as shall be necessary and proper for the promotion of the educational and benevolent purposes of said corporation, which shall not be divided among the members of the corporation, but shall descend to their successors for the promotion of the objects aforesaid.

SEC. 3. That said corporation shall have a constitution and regulations or by-laws and shall have power to amend the same at pleasure: *Provided,* that such constitution and regulations or by-laws do not conflict with the laws of the United States or of any State.

SEC. 4. That said association may hold its meetings in such places as said incorporators shall determine, and shall report to Congress, through the president of the Columbia Institution for the Deaf and Dumb at Washington, District of Columbia, such portion of its proceedings and transactions as its officers shall deem to be of general public interest and value concerning the education of the deaf.

[Act of Mar. 3, 1897, 54th Cong., 2d sess. (29 Stat. L., p. 681).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-eight, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of June 4, 1867, 55th Cong., 1st sess. (30 Stat. L., p. 38).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-eight, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the deaf and dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-four thousand five hundred dollars.

For repairs to the buildings of the institution and to provide for increased water supply and protection against fire, three thousand dollars.

* * * * *

[Act of July 19, 1867, 55th Cong., 1st sess. (30 Stat. L., p. 127).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, eighteen hundred and ninety-seven, and for prior years, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For repairs of damages to buildings occasioned by the hurricane of September, eighteen hundred and ninety-six, being for the fiscal year eighteen hundred and ninety-seven, seven hundred and sixty-five dollars.

* * * * *

[Act of June 30, 1868, 55th Cong., 2d sess. (30 Stat. L., p. 540).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, eighteen hundred and ninety-nine, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary; and all disbursements for this object shall be accounted for through the Department of the Interior.

* * * * *

[Act of July 1, 1868, 55th Cong., 2d sess. (30 Stat. L., p. 624).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, eighteen hundred and ninety-nine, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-four thousand five hundred dollars: *Provided*, That directors appointed under the provisions of section forty-eight hundred and sixty-three of the Revised Statutes of the United States shall remain in office until the appointment and acceptance of office of their successors; and the directors of the institution shall have control of the disbursement of all moneys appropriated by Congress for the benefit of said institution, accounts for which shall be settled and adjusted at the Treasury Department as required by the provisions of section two hundred and thirty-six of the Revised Statutes.

For repairs to the buildings of the institution, including plumbing and steam-heating apparatus, and for repairs to pavements within the grounds, three thousand dollars.

* * * * *

[Act of Mar. 3, 1869, 55th Cong., 3d sess. (30 Stat. L., p. 1061).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of Mar. 3, 1899, 55th Cong., 3d sess. (30 Stat. L., p. 1101).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-four thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam-heating apparatus, and for repairs to pavements within the grounds, three thousand dollars.

Hereafter one-half of the indefinite appropriation to pay for the instruction of the indigent blind children of the District of Columbia, formerly instructed in the Columbia Institution for the Instruction of the Deaf, Dumb, and Blind, shall be paid out of the revenues of the District of Columbia and the other half out of the Treasury of the United States.

* * * * *

[Act of June 6, 1900, 56th Cong., 1st sess. (31 Stat. L., p. 575).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and one, and for other purposes.

* * * * *

FOR INSTRUCTION OF THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of June 6, 1900, 56th Cong., 1st sess. (31 Stat. L., p. 620).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and one, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-four thousand five hundred dollars: *Provided*, That the number of the beneficiaries in said institution, authorized by the act of August thirtieth, eighteen hundred and ninety, to be received from the several States and Territories, is hereby increased from sixty to one hundred.

For repairs to the buildings of the institution, including plumbing and steam-heating apparatus, and for repairs to pavements within the grounds, three thousand dollars.

* * * * *

[Act of Mar. 1, 1901, 56th Cong., 2d sess. (31 Stat. L., p. 844).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and two, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary: *Provided*, That hereafter all deaf mutes of teachable age, of good mental capacity, and properly belonging to the District of Columbia shall be received and instructed in said institution, their admission thereto being subject to the approval of the superintendent of public schools in the District of Columbia. And said institution shall not be regarded nor classified as an institution of charity.

* * * * *

[Act of Mar. 3, 1901, 56th Cong., 2d sess. (31 Stat. L., p. 1164).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and two, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-six thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam-heating apparatus, and for repairs to pavements within the grounds, three thousand dollars.

* * * * *

[Act of Feb. 14, 1902, 57th Cong., 1st sess. (32 Stat. L., p. 19).]

An Act Making appropriations to supply urgent deficiencies in the appropriations for the fiscal year ending June thirtieth, nineteen hundred and two, and for prior years, and for other purposes.

* * * * *

Columbia Institution for Deaf and Dumb.—For support of the institution, in addition to the amount appropriated for this object in the sundry civil appropriation act approved March third, nineteen hundred and one, said additional expense having been made necessary by the increase in the number of beneficiaries authorized by act of Congress approved June sixth, nineteen hundred, two thousand dollars.

* * * * *

[Act of June 28, 1902, 57th Cong., 1st sess. (32 Stat. L., p. 457).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and three, and for other purposes.

* * * * *

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-eight thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam heating apparatus, and for repairs to pavements within the grounds, three thousand dollars.

To provide suitable protection against disaster by fire to the buildings of the institution, three thousand two hundred and ninety-one dollars, to be immediately available.

* * * * *

[Act of July 1, 1902, 57th Cong., 1st sess. (32 Stat. L., p. 606).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and three, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of Mar. 3, 1903, 57th Cong., 2d sess. (32 Stat. L., p. 971).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and four, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of Mar. 3, 1903, 57th Cong., 2d sess. (32 Stat. L., p. 1055).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, nineteen hundred and three, and for prior years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, one thousand five hundred dollars.

* * * * *

[Act of Mar. 3, 1903, 57th Cong., 2d sess. (32 Stat. L., pp. 1120-1121).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and four, and for other purposes.

Current expenses of the Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, fifty-eight thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, three thousand dollars.

For additions to the buildings of the institution to provide additional accommodations for students and officers, for schoolrooms, and to enlarge the laundry, thirty thousand dollars.

[Act of Feb. 18, 1904, 58th Cong., 2d sess. (33 Stat. L., p. 31).]

An Act Making appropriations to supply urgent deficiencies in the appropriations for the fiscal year ending June thirtieth, nineteen hundred and four, and for prior years, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, one thousand five hundred dollars.

[Act of Apr. 27, 1904, 58th Cong., 2d sess. (33 Stat. L., p. 390).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and five, and for other purposes.

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, ten thousand five hundred dollars, or so much thereof as may be necessary.

[Act of Apr. 23, 1904, 58th Cong., 2d sess. (33 Stat. L., p. 493).]

An Act Making appropriations for sundry civil expenses of the Government for the year ending June thirtieth, nineteen hundred and five, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty thousand dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, three thousand dollars.

[Act of Mar. 3, 1905, 58th Cong., 3d sess. (33 Stat. L., p. 901).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and six, and for other purposes.

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and this provision shall apply to appropriations made for the same object for the fiscal years nineteen hundred and four and nineteen hundred and five, ten thousand five hundred dollars, or so much thereof as may be necessary. And the directors of said institution are hereby authorized to provide for the education of colored deaf-mute children properly belonging to the District of Columbia, in the Maryland School for Colored Deaf-Mutes, or some other suitable school, at a cost not exceeding the per capita expense of educating the State pupils in such school.

[Act of Mar. 3, 1905, 58th Cong., 3d sess. (33 Stat. L., p. 1189).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and six, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty thousand dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, three thousand dollars.

For additions to the buildings of the institution, to furnish additional accommodations for pupils, and to provide for the heating of the buildings from a central plant, and for lighting the buildings by electricity, thirty thousand dollars.

* * * * *

[Act of Mar. 3, 1905, 58th Cong., 3d sess. (33 Stat. L., p. 1235).]

An Act Making appropriations to supply deficiencies in the appropriations for the fiscal year ending June thirtieth, nineteen hundred and five, and for prior years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For the support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, for the fiscal year nineteen hundred and five, two thousand five hundred dollars.

* * * * *

[Act of Feb. 27, 1906, 59th Cong., 1st sess. (34 Stat. L., p. 37).]

An Act Making appropriations to supply urgent deficiencies in the appropriations for the fiscal year ending June thirtieth, nineteen hundred and six, and for prior years, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, two thousand five hundred dollars.

For the maintenance and tuition of colored deaf-mutes of teachable age belonging to the District of Columbia in the Maryland School for Colored Deaf-Mutes, as authorized by an act of Congress approved March third, nineteen hundred and five, four thousand five hundred dollars, one-half of this amount to be paid from the revenues of the District of Columbia and one-half from any money in the Treasury not otherwise appropriated.

* * * * *

[Act of June 27, 1906, 59th Cong., 1st sess. (34 Stat. L., p. 503).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and seven, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, ten thousand five hundred dollars, or so much thereof as may be necessary. And the directors of said institution are hereby authorized to provide for the education of colored deaf-mute children properly belonging to the District of Columbia in the Maryland School for Colored Deaf-Mutes, or some other suitable school, at a cost not exceeding the per capita expense of educating the State pupils in such school.

For the maintenance and tuition of colored deaf-mutes of teachable age belonging to the District of Columbia in the Maryland School for Colored Deaf-Mutes, as authorized in an act of Congress approved March third, nineteen hundred and five, six thousand and fifty dollars.

* * * * *

[Act of June 30, 1906, 59th Cong., 1st sess. (34 Stat. L., p. 731).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and seven, and for other purposes.

* * * * *
Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-two thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, five thousand dollars.

* * * * *

[Act of Mar. 2, 1907, 59th Cong., 2d sess. (34 Stat. L., p. 1142).]

An Act Making appropriations to provide for the expenses of the Government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and eight, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, ten thousand five hundred dollars, or so much thereof as may be necessary.

For the maintenance and tuition of colored deaf-mutes of teachable age belonging to the District of Columbia in the Maryland School for Colored Deaf-Mutes, as authorized in an act of Congress approved March third, nineteen hundred and five, six thousand and fifty dollars.

* * * * *

[Act of Mar. 4, 1907, 59th Cong., 2d sess. (34 Stat. L., p. 1338).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and eight, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-two thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, five thousand dollars.

* * * * *

[Act of May 26, 1908, 60th Cong., 1st sess. (35 Stat. L., p. 295).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and nine, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, ten thousand five hundred dollars, or so much thereof as may be necessary.

* * * * *

[Act of May 27, 1908, 60th Cong., 1st sess. (35 Stat. L., p. 352).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and nine, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-two thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, five thousand dollars.

For the proper inclosure of the grounds of the institution and the grading made necessary by the opening of West Virginia Avenue on the eastern boundary of the grounds, five thousand dollars.

* * * * *

[Act of Mar. 3, 1909, 60th Cong., 2d sess. (35 Stat. L., p. 710).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and ten, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For expense attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, ten thousand five hundred dollars, or so much thereof as may be necessary.

[Act of Mar. 4, 1909, 60th Cong., 2d sess. (35 Stat. L., p. 991).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and ten, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-five thousand dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting and for repairs to pavements within the grounds, five thousand dollars.

[Act of May 18, 1910, 61st Cong., 2d sess. (36 Stat. L., p. 398).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and eleven, and for other purposes.

Columbia Institution for the Deaf and Dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four, of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, ten thousand dollars, or so much thereof as may be necessary.

[Act of June 25, 1910, 61st Cong., 2d sess. (36 Stat. L., p. 746).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and eleven, and for other purposes.

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-seven thousand dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, five thousand dollars.

[Act of June 25, 1910, 61st Cong., 2d sess. (36 Stat. L., p. 796).]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year nineteen hundred and ten, and for other purposes.

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

Columbia Institution for the Deaf and Dumb.—To provide for the rebuilding of the west dormitory, which has lately been partially destroyed by fire, twenty-five thousand dollars, or so much thereof as may be necessary, to continue available during the fiscal year nineteen hundred and eleven.

[Act of Mar. 2, 1911, 61st Cong., 3d sess. (36 Stat. L., p. 989).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and twelve, and for other purposes.

* * * * *

Columbia Institution for the Deaf and Dumb.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf and Dumb from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the Act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, eleven thousand dollars, or so much thereof as may be necessary.

* * * * *

[Act of Mar. 4, 1911, 61st Cong., 3d sess. (36 Stat. L., p. 1309).]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year nineteen hundred and eleven, and for prior years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR DEAF AND DUMB.

The expenditures incurred during the current fiscal year for furnishing and equipping the western dormitory of the Columbia Institution for the Deaf and Dumb, partially destroyed by fire February sixth, nineteen hundred and ten, and for resurfacing asphalt walks and driveways adjacent thereto, may be paid from the appropriation available for the current year for rebuilding of the western dormitory.

* * * * *

[Act of Mar. 4, 1911, 61st Cong., 3d sess. (36 Stat. L., p. 1422).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and twelve, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF AND DUMB.

For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, sixty-six thousand five hundred dollars.

For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, five thousand dollars.

For the building of a new dairy barn to accommodate thirty cows; for the construction of a milk house and silo; for the repair of present barns and stable; and for adding to and altering the greenhouse, twelve thousand five hundred dollars.

From and after the passage of this act the Columbia Institution for the Deaf and Dumb shall be known and designated as the Columbia Institution for the Deaf.

* * * * *

[Act of June 26, 1912, 62d Cong., 1st sess. (37 Stat. L., p. 162).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and thirteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, eleven thousand five hundred and fifty dollars, or so much thereof as may be necessary.

* * * * *

[Act of Aug. 24, 1912, 62d Cong., 1st sess. (37 Stat. L., p. 461).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and thirteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, \$66,500.
For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$5,000.

* * * * *

[Act of Mar. 4, 1913, 62d Cong., 3d sess. (37 Stat. L., p. 917).]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year nineteen hundred and thirteen, and for prior years, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For additional amount required for expenses attending the instruction of deaf persons admitted to the Columbia Institution for the Deaf from the District of Columbia, \$700.

* * * * *

[Act of Mar. 4, 1913, 62d Cong., 3d sess. (37 Stat. L., p. 958).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and fourteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the Commissioners of the District of Columbia, \$11,900, or so much thereof as may be necessary.

* * * * *

[Act of June 23, 1913, 63d Cong., 1st sess. (38 Stat. L., p. 959).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and fourteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, for books and illustrative apparatus, and for general repairs and improvements, \$66,500.
For repairs to the buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$5,000.

* * * * *

[Act of Apr. 6, 1914, 63d Cong., 2d sess. (38 Stat. L., p. 322).]

An Act Making appropriations to supply urgent deficiencies in appropriations for the fiscal year nineteen hundred and fourteen, and for prior years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$3,000.

* * * * *

[Act of July 21, 1914, 63d Cong., 2d sess. (38 Stat. L., p. 537).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and fifteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$12,250, or so much thereof as may be necessary.

* * * * *

[Act of Aug. 1, 1914, 63d Cong., 2d sess. (38 Stat. L., p. 650).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and fifteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$70,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$6,000.

For special repairs and improvements, lighting, heating, and power system, \$21,000.

* * * * *

[Act of Mar. 3, 1915, 63d Cong., 3d sess. (38 Stat. L., p. 864).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and sixteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$70,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$6,000.

* * * * *

[Act of Mar. 3, 1915, 63d Cong., 3d sess. (38 Stat. L., p. 911).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and sixteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$12,250, or so much thereof as may be necessary.

* * * * *

[Act of July 1, 1916, 64th Cong., 1st sess. (39 Stat. L., p. 310).]

An Act making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and seventeen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$70,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$6,000.

For the construction of a new sewer from farm to West Virginia Avenue, for a twenty-five horsepower engine and direct-connected fifteen-kilowatt generator for power plant, and for additional machinery for the shop, \$2,400.

For the removal of the college women's dormitory and the construction, equipment, and furnishing of a new dormitory, necessary repairs, or replacement of walks and grading of grounds adjacent to said dormitory, including all material, personal and other services, and for each and every purpose in connection therewith, to be expended under the direction of the Superintendent of the Capitol Building and Grounds, \$90,000, not more than \$3,000 of which may be used for providing temporary quarters, through rental or otherwise, for the use of students and officers of the institution.

Upon the passage of this act the title to all that parcel of land lying between the west boundary of West Virginia Avenue, said avenue now being laid out with a width of sixty-six feet, and the east boundary of the grounds of the Columbia Institution for the Deaf, said parcel of land fronting on Florida Avenue about ten and one-half feet and containing one-tenth of an acre, more or less, and being formerly part of the Baltimore and Ohio Railroad right of way, shall be vested in the Columbia Institution for the Deaf, United States of America, trustee, and the Secretary of the Interior is hereby authorized and directed to issue a patent for the said parcel of land to the said Columbia Institution for the Deaf.

* * * * *

[Act of Sept. 1, 1916, 64th Cong., 1st sess. (39 Stat. L., p. 699).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and seventeen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$13,200, or so much thereof as may be necessary.

* * * * *

[Act of Sept. 8, 1916, 64th Cong., 1st sess. (39 Stat. L., p. 806).]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June thirtieth, nineteen hundred and sixteen, and prior fiscal years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$672.13.

* * * * *

[Ibid, p. 818]:

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For additional amount for the removal of the college women's dormitory, and the construction, equipment, and furnishing of a new dormitory, necessary repairs or replacement of walks and grading of grounds adjacent to said dormitory, including all material, personal and other services, and for each and every purpose in connection therewith, to be expended under the direction of the Superintendent of the Capitol Building and Grounds, fiscal year nineteen hundred and seventeen, \$53,000.

* * * * *

[Act of Mar. 3, 1917, 64th Cong., 2d sess. (39 Stat. L., p. 1027).]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and eighteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$15,200, or so much thereof as may be necessary.

* * * * *

[Act of Apr. 17, 1917, 65th Cong., 1st sess. (40 Stat. L., p. 7).]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June thirtieth, nineteen hundred and seventeen, and prior fiscal years, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$2,175, or so much thereof as may be necessary.

* * * * *

[Act of June 12, 1917, 65th Cong., 1st sess. (40 Stat. L., p. 153).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and eighteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$71,500.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$6,000.

For the purchase and installation of typesetting and type-casting machinery, cylinder press, job press, stitching machine, type metal, and other necessary office fixtures and machinery for the complete equipment of a modern printing office to be used for the instruction of students and pupils of the institution, \$7,000.

* * * * *

[Act of Oct. 6, 1917, 65th Cong., 1st sess. (40 Stat. L., p. 373).]

An Act Making appropriations to supply urgent deficiencies in appropriations for the fiscal year ending June thirtieth, nineteen hundred and eighteen, and prior fiscal years, on account of war expenses, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For additional amount for the removal of the college women's dormitory, and the construction, equipment, and furnishing of a new dormitory, necessary repairs or replacement of walks and grading of grounds adjacent to said dormitory, including all materials, personal and other services, and for each and every purpose in connection therewith, to be expended under the direction of the Superintendent of the Capitol Building and Grounds, \$21,000.

* * * * *

[Act of Mar. 28, 1918, 65th Cong., 2d sess. (40 Stat. L., p. 491).]

An Act Making appropriations to supply urgent deficiencies in appropriations for the fiscal year ending June thirtieth, nineteen hundred and eighteen, and prior fiscal years, on account of war expenses, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$6,000.

For additional for the removal of the college women's dormitory, and the construction, equipment, and furnishing of a new dormitory, necessary repairs or replacement of walks and grading of grounds adjacent to said dormitory, including all material, personal and other services, and for each and every purpose in connection therewith, to be expended under the direction of the Superintendent of the Capitol Building and Grounds, \$18,500.

* * * * *

[Act of July 1, 1918, 65th Cong., 2d sess. (40 Stat. L., p. 690).]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June thirtieth, nineteen hundred and nineteen, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$32,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$6,000.

The number of beneficiaries in said institution authorized by the act of June sixth, nineteen hundred (Thirty-first Statutes, page six hundred and twenty), to be received from the several States and Territories, is increased from one hundred to one hundred and twenty-five.

* * * * *

[Act of Aug. 31, 1918, 65th Cong., 2d sess. (40 Stat. L., p. 937).]

An Act Making appropriations to provide for the expenses of the Government of the District of Columbia for the fiscal year ending June thirtieth, nineteen hundred and nineteen, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section forty-eight hundred and sixty-four of the Revised Statutes, and as provided for in the act approved March first, nineteen hundred and one, and under a contract to be entered into with the said institution by the commissioners, \$16,000, or so much thereof as may be necessary.

* * * * *

[Act of July 11, 1919, 66th Cong., 1st sess.—Public, No. 5.]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1919, and prior fiscal years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$3,000.

* * * * *

[Act of July 11, 1919, 66th Cong., 1st sess.—Public, No. 6.]

An Act Making appropriations to provide for the expenses of the Government of the District of Columbia for the fiscal year ending June 30, 1920, and for other purposes..

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section 4864 of the Revised Statutes, and as provided for in the Act approved March 1, 1901, and under a contract to be entered into with the said institution by the commissioners, \$18,000, or so much thereof as may be necessary.

* * * * *

[Act of July 19, 1919, 66th Cong., 1st sess.—Public, No. 21.]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1920, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$85,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$7,500.

* * * * *

[Act of Nov. 4, 1919, 66th Cong., 1st sess.—Public, No. 73.]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1920, and prior fiscal years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For repairs to the cottage damaged by fire on August 26, 1919, \$2,000.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

[Act of Mar. 6, 1920, 66th Cong., 2d sess.—Public, No. 155.]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1920, and prior fiscal years, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$3,000.

* * * * *

[Act of June 5, 1920, 66th Cong., 2d sess.—Public, No. 245.]

An Act Making appropriations to provide for the expenses of the government of the District of Columbia for the fiscal year ending June 30, 1921, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section 4864 of the Revised Statutes, and as provided for in the act approved March 1, 1901, and under a contract to be entered into with the said institution by the commissioners, \$20,250, or so much thereof as may be necessary.

* * * * *

[Act of June 5, 1920, 66th Cong., 2d sess.—Public No. 246.]

An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1921, and for other purposes.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For support of the institution, including salaries and incidental expenses, books and illustrative apparatus, and general repairs and improvements, \$90,000.

For repairs to buildings of the institution, including plumbing and steam fitting, and for repairs to pavements within the grounds, \$8,500.

For painting and equipping new women's dormitory building, and finishing grading and walks adjacent thereto, \$5,000.

* * * * *

[Act of June 5, 1920, 66th Cong., 2d sess.—Public No. 264.]

An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1920, and prior fiscal years, and for other purposes.

* * * * *

Columbia Institution for the Deaf.—For expenses attending the instruction of deaf and dumb persons admitted to the Columbia Institution for the Deaf from the District of Columbia, under section 4864 of the Revised Statutes, and as provided for in the act approved March 1, 1901, and under a contract to be entered into with the said institution by the commissioners, \$1,800, or so much thereof as may be necessary.

* * * * *

COLUMBIA INSTITUTION FOR THE DEAF.

For repairs at main power plant, including installation of new boiler tubes and of mechanical stokers, \$6,500.

* * * * *

APPENDIX D.

ADDRESS OF HON. LESLIE M. SHAW.

MR. SHAW. Mr. President, members of the board, distinguished guests, ladies, and gentlemen: Mark Twain records that he once called at the White House to meet the President, then Gen. Grant. They were introduced. Grant said nothing. Mark Twain could think of nothing to say. So he said "I am embarrassed. Are you?"

It is true that I became interested in schools like this some years ago but I did not learn to talk this language, but I know enough of human nature to know that every one desires to succeed in life and I know enough also to know that every one knows how. It would be foolish for me to attempt to tell these young people how to succeed, for even those little fellows back there know all the essentials and, yet, the majority of them will fail.

You know, it is claimed that 9 out of 10 of the people of the world are dependent upon their children to take care of them after they are 65 or rather 60 years of age. So, you see what you have to do as your children get older, and what your children will have to do when you get old.

If I were to ask these boys and girls how to succeed they would probably tell me to work. There are a great many people just now who would like to succeed in some other way. Just at the present time work is unpopular. I said to one of the professors here to-day: "My criticism of the educational system of this country is that they teach that work is honorable and very undesirable." The whole atmosphere of the schoolroom is that if you get some education you will never need any left-hand to give bread to your mouth.

I don't know how he is succeeding. Are you going along all right?

PRESIDENT HALL. Yes.

MR. SHAW. Well, I congratulate you. You know, I don't know whether you people understand it or not, but there is a saying that you can live from hand to mouth while you are young, but the distance will increase as you get older, and you will find it a long way from hand to mouth after you are 60, unless you have something saved up.

Of course, it is very disreputable in these days to save anything up, but if you should save something by it will come in very handy in after years.

I told you a moment ago it would be necessary to work. I don't know what you people know about industry, but I am not the only one present who was reared when industry was not only popular but universal.

And, I am going to say to you girls, for I am an expert. I have either touched or seen life at every angle. I will not take your time to tell you some of the angles at which I have touched life with my naked hands, but as an expert I am going to tell you that the happy people of this world—women, as well as men—are those who rise to daily tasks, those who have something to do. Now, I know, I have seen them. I know the women who are not happy, some of them, not as many as I wish I knew, but a woman doesn't get much happiness out of life when she rises in the morning and wonders what she is going to do all day—whether it will be the automobile, the yacht, or a bridge party, or whether she will go down town and buy another hat.

I know a lady who buys an average of two hats a month, costing from fifty to two hundred dollars a hat, but I am going to tell all of you good people that there is no happiness in buying two hats a month. I know how a woman gets happiness in buying a hat. She goes down and looks one over and says: "This is a little too expensive." She looks at another one. Finally, she buys one that is a little too expensive and gets up in the night and looks at that hat. That is the way to get happiness out of a hat. Happiness comes from tasks performed and the little rewards that come out of them.

My friend told you that I was once governor of my State. That is true, and it was during the time of the Spanish War and I appointed two surgeons to assist my surgeon in examining four regiments of soldiers for the war and I selected surgeons with more than State reputations. One of them I had seen going by in his carriage a hundred times, but I never saw him through the carriage door that he was not studying, and the other surgeon I had called upon twice at midnight and unannounced, and I found him in his office, working at midnight.

Now, I want you to keep this in mind; that this world keeps a one-price store. Whoever pays the price gets the goods, and I am telling you that the price that those two men paid for a reputation in their profession reaches beyond the State in which they lived.

I told this one time down in Pennsylvania some place and this occurred out in Des Moines and a man in the audience down in Pennsylvania said: "Was that Dr. Priestley?" I said, "Yes." They had heard of him.

I will give you one more. I could give you a thousand just as well.

Senator Hanna—I don't know how you put that in the sign language—Senator Hanna told me that he one time had an occasion to call upon Phil Armour. He didn't tell me what it was about, but it was in 1896. A few of these girls over here and one or two of the boys know what I mean.

He said he called at 1 o'clock by appointment. He found the great packer in the barber's chair, eating his lunch and dictating to a stenographer. It was the only leisure time he had. Now, you boys and girls don't need to work like that if you don't want to. I am only telling you the price that Phil Armour paid for writing his name under every sky and in every language.

There are no bargain counters for those goods. Whoever pays the price gets the goods.

Now, my wife—my wife and I are on speaking terms and she is the best woman in the world and always gives good advice. She asked me last night if I was preparing a speech. I told her no, I didn't have any more ideas what I would say than she had. So when I left to-day she said, "Don't talk very long."

And I am not going to stop yet. I don't know when I will get another chance to talk to as nice a bunch of boys and girls as you are and the only hope in the world in the way of talking is talking to young people. You waste your time to talk to these [indicating persons on platform]. But there is some hope in a bunch of young people like this. So I am going to tell you this story. I don't know whether it is true or not. It is not original. I like to think that it is true.

The owner of Axtell—and you young people don't remember Axtell—Axtell was a trotting horse and a wonder in his day. The owner of Axtell was very proud of him. He said, "In the first place, the best blood of all the trotting racers is in his veins." A great trick, Doctor, to have good ancestors. And I want you to be careful about that, and then I want you to be careful also that your children have good ancestors.

And the owner of Axtell said of him, "Besides that, he is a good individual. He is well built. He has good muscles, good limbs, a good head, good nostrils."

It's a great thing to have a good physique, to be of comely appearance. That is self-evident. It is a great thing to have a good, presentable physique.

And then he said of Axtell, "He has always had good environments, good surroundings. He has never stood in the stable except with thoroughbreds, and he has never run in the pasture with scrubs."

It is a good thing to have good environments and associates. You will have more to say and more to do about choosing your associates than you will your ancestors, but one is quite as important as the other.

Then the owner put Axtell in a school. He got a trainer for him and Axtell did pretty well. He did as well as the other "kids"; kept up with his class; but Axtell wouldn't do as well as he might do, and so the owner became dissatisfied and took him out of that school and put him in another school. They do that with horses. But Axtell wouldn't do quite as well as he might. He would keep up with the class but he could always see that he might do better than he was doing. He was what they call a loafer among horses. There are those.

Finally there came a day like this day with these people when the school is over and the owner takes the lines. Axtell did pretty well. I think he got second money at 1 mile, but he might do better.

Until, finally, all out of patience one day the owner rose in the sulky and put poor Axtell under the whip until trying to escape the stinging of the lash he made the happy discovery that he could trot faster than he could run. Charlie Williams brought him back to the stable and said that night, "He is worth \$10,000," but he sold him for \$117,000.

And Axtell was as pleased as his owner when he found out what he could do.

My trip out here to-day will not be lost if I impress upon you good people what wonderful things you can do when you take the lines of your own life and put yourself unmercifully under the whip.

Now, they will think this is a horse story. Well, I can tell men stories from now till morning better than that.

I knew a man in after life who at 19 years of age was a common laborer—just as honorable as anything; not quite as desirable as some things. He couldn't boast of any ancestry and he couldn't boast of his own personal appearance and he couldn't boast of his environment; but by the premature discharge of a cannon one Fourth of July morning he lost his right hand at the wrist and his left hand at a half inch in front of the thumb. Nineteen years of age. No education. But he realized that he had a job on his hands and he started in to get an education.

He told me that he threaded his own needle, sewed on his own buttons, with that naked thumb on his left hand. He was introduced to me at Rutland, Vt., as judge. That was Judge Wayne Bailey. He died president of a bank with many millions on deposit.

Like Axtell, he had discovered what he could do, in spite of all the handicap, by putting himself unmercifully under the lash.

Well, do you know why it is so many people are dissatisfied? We are the best fed, the best clothed, the best housed, the best educated, and the best people on the face of the earth. We have more comforts, far more luxuries, suffer less privations and hardships than any other people, and yet dissatisfied, restless, and unhappy. Why?

I am going to guess in your presence that we have made a mistake with reference to the unit of life's measure. You know if you start out to weigh anything you have got to have a correct measure. If you start out to measure a distance you have got to have a correct yardstick. If you are going to measure human life you want the right standard to measure with. Do you get me? And you somehow thought the only measurement there was was the dollar. If a man didn't have many dollars he didn't amount to very much. Saks said of all mankind, "I classify the lot: Those who have money and those who have not; just two kinds." I wonder if there is anything else? Any other measure that is worth while? I am not going to spend much time on that, but, you know, one trouble is that we lose sight of all this difference in aptitude. We don't complain because one fellow has an aptitude for decorative art and another for salt mines, but we complain because one man has an aptitude to make money and the other has not.

We are all of us glad that our civilization will produce a Thomas Edison and we are all unhappy because it produces a John D. Rockefeller. Two wizards. One we are glad to have and the other we are sorry to have. I am not going to discuss it as to which did most for the world. It doesn't matter. But I want you to keep in mind that we are having perhaps the wrong standard.

While I was governor of Iowa I stood on the porch of one of the very humble and very typical Iowa homes one day. Out in the street for more than a block the people stood as thick as they could stand, and as far as I could see I could discern men and women in tears. Why? The man in the casket back of me had walked into Fort Dodge, Iowa, barefooted, when a young man. He was the first teacher in that pioneer town. He married and lived there. Practiced law there. Superintended the schools. County surveyor. Went to the legislature. Went to Congress. Was governor of his State. But in no place, in no one of those positions, did he show any great aptitude or ability.

He was a good teacher; not better than others. A good surveyor. He was a comfortable kind of a lawyer. He didn't do anything bad in the legislature. The records over here at the Congressional Library contain no great speeches that he made. As governor of Iowa he was not even a reformer. He left his State as good as he found it, and a half dozen of his successors couldn't say that.

But the point I am making is this: At no place in his long and useful life did he fall below the high standard of a Christian gentleman, and I just want to leave with you young people this thought. I don't know what you are going to do. I don't know what the world has in store for you, but you will probably get as much out of the world as you put in and you are entitled to no more.

But I want you to know this: That if you perform the tasks that come to you in the great distribution of the world's work, this thing will come to you. Something else will come to the others. You can't tell how it comes. You will get your detail.

If I was to ask the doctor here how it happened that he came here, he wouldn't be able to tell me, perhaps, but it was some little circumstance that turned his tide here instead of somewhere else.

If I would ask these ladies how they happened to meet their husbands, well, just some little circumstance. If I should ask them how it happened that they never met me, they wouldn't be able to tell. I wouldn't either.

John Hay told me once that if he had been out of his office at 5 o'clock on a given day the whole current of his life would have been changed. He intended to go about 5 o'clock. A man friend came in and said, "We have a dinner party at our house. One of the guests can't come. Put on your dress suit and come." He did so, and there he met Miss Stone and married her with her millions. What a splendid detail.

The little circumstances turn the whole current of our lives, and as the work of the world is being divided up, these different tasks come to different people.

The thought I want to leave with you is this: That he who performs these tasks that come to him, whether it be on the farm or in the kitchen, in the office or in public office, who meets these tasks and falls not below the high standard of a Christian gentleman has made success in life, and success measured by that yardstick is within the reach—not the easy reach—but within the reach of every one in this school and every other school.

I thank you. [Applause.]

APPENDIX E.

REGULATIONS.

1. The academic year is divided into three terms, the first beginning on the last Thursday in September and closing on the 24th of December; the second beginning the 29th of December and closing the next to the last Friday in March; the third beginning on the following Monday and closing the Wednesday before the last Wednesday in June.

2. The vacation is from the Wednesday before the last Wednesday in June to the last Thursday in September.

3. There are holidays at Thanksgiving, Christmas, Washington's Birthday, Easter, and Decoration Day.

4. Pupils may visit their homes during the regular vacation period and on the above-named holidays, but at no other time unless for some special urgent reason, and then only by permission of the president.

5. The bills for the maintenance and tuition of pupils supported by their friends must be paid semiannually in advance.

6. The charge for pay pupils is \$400 per annum. This sum covers all expenses in the primary department except clothing and extraordinary medical attention, and all in the college except clothing, books, and extraordinary medical attention.

7. All deaf-mutes of teachable age, of good mental capacity, and properly belonging to the District of Columbia are received without charge. To students from the States and Territories, who have not the means of defraying all the expenses of the college course, the board of directors renders such assistance as circumstances seem to require, so far as the means at its disposal will allow.

8. It is expected that the friends of the pupils will provide them with clothing, and it is important that upon entering or returning to the institution they should be supplied with a sufficient amount for an entire year. All clothing should be plainly marked with the owner's name. The students are required to furnish their own towels.

9. All letters concerning pupils or applications for admission should be addressed to the president.

10. The institution is open to visitors during term time on Thursdays only, between the hours of 9 a. m. and 3 p. m. Visitors are admitted to chapel service on Sunday afternoons at 3.30 p. m.

DEPARTMENT OF THE INTERIOR

REPORT
OF THE
FREEDMEN'S HOSPITAL
TO THE
SECRETARY OF THE INTERIOR
FOR THE
FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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ROSTER OF OFFICERS.

STAFF.

W. A. Warfield, M. D., *Surgeon in Chief.* B. Price Hurst, M. D., *Pathologist.*
P. M. Murray, M. D., *Assistant Surgeon.* L. H. Brown, jr., M. D., *Anesthetist.*
N. W. Harris, M. D., *Resident Physician.*

NURSES.

Laura R. MacHale, Registered Nurse, New Jersey, *Superintendent.*
Emma M. Irwin, Registered Nurse, Illinois, *Assistant Superintendent.*
Martha E. Cabaniss, Registered Nurse, Virginia, *Night Supervisor.*
Lulu E. Thompson, *Head Nurse.*
Elizabeth B. Howland, Registered Nurse, West Virginia, *Head Nurse.*
Bertha J. Thomas, Registered Nurse, Pennsylvania, *Head Nurse.*

CLERK AND ASSISTANTS.

F. D. Henry, G. S. Jackson (stenographer), M. E. Wormley.

INTERNES.

Henry J. Austin, M. D.	Lawrence W. Jackson, M. D.
Charles H. Boyd, M. D.	Herbert O. Matthews, M. D.
Stansbury M. Carter, M. D.	H. C. Stratton, M. D.
J. R. Contee Cook, M. D.	J. B. Walker, M. D.
Eugene H. Dibble, jr., M. D.	Ralph J. Young, M. D.
Archie R. Fleming, M. D.	Charles I. Watson, <i>Assistant Pharmacist.</i>
John S. Mitchell, <i>Pharmacist.</i>	

ADVISORY VISITING STAFF.

Edward A. Balloch, M. D.	Jas. J. Richardson, M. D.
Edward D. Williston, M. D.	J. E. H. Taylor, M. D.
Wm. A. Jack, M. D.	

VISITING STAFF.

INDOOR.

Medical.

Henry P. Parker, M. D.	C. A. Brooks, M. D.
Caryl Burbank, M. D.	Lewis Ecker, M. D.
Thos. Martin, M. D.	E. C. Terry, M. D.
Robert W. Brown, M. D.	W. M. Lane, M. D.

Surgical.

E. A. Balloch, M. D.	A. M. Curtis, M. D.
Wm. A. Jack, M. D.	J. E. H. Taylor, M. D.
Associates: A. L. Curtis, M. D.; A. B. McKenney, M. D.	

Gynecological.

Wm. A. Warfield, M. D.	H. W. Lawson, M. D.
S. L. Carson, M. D.	J. W. Ross, M. D.
S. L. Cook, M. D.	H. R. Burwell, M. D.
T. E. Jones, M. D.	J. E. H. Taylor, M. D.

Obstetrical.

E. D. Williston, M. D.
H. F. Kane, M. D.

H. W. Freeman, M. D.

Ophthalmological.

James C. Dowling, M. D.

Otology and Rhinology.

J. J. Richardson, M. D. Associate: Hamilton S. Martin, M. D.

Neurology.

Tom A. Williams, M. D. Associates: E. G. Mitchell, M. D.; Harry A. Bishop, M. D.

Genito-Urinary.

H. A. Fowler, M. D. Associates: M. A. Francis, M. D.; R. Arthur Hooe, M. D.

Orthopedics.

Wm. G. Erving, M. D.
John Dunlop, M. D.

John A. Talbot, M. D.
Chas. A. Allen, M. D.

Pediatrics.

Wm. J. French, M. D. Associates: A. B. McKenney, M. D.; Frank Cook, M. D.;
S. L. Cook, M. D.

Dental Surgeons.

Geo. H. Butcher, D. D. S.

F. P. V. Barrier, D. D. S.

OUTDOOR.

Medical.

W. E. Lewis, M. D.
O. A. Tignor, M. D.
W. F. Phillips, M. D.
J. F. Dyer, M. D.
Lee A. Gill, M. D.

Malachi M. Lucas, M. D.
Oliver L. Humble, jr., M. D.
H. C. Lynch, M. D.
E. C. Wiggins, M. D.

Minor Surgery.

Wm. A. Jack, M. D.
O. W. Childs, M. D.

A. L. Curtis, M. D.

Ophthalmological.

James C. Dowling, M. D.

Otology and Rhinology.

J. J. Richardson, M. D. Associates: Hamilton S. Martin, M. D.; U. L. Houston, M. D.

Neurology.

Tom A. Williams, M. D. Associates: E. G. Mitchell, M. D.; Harry A. Bishop, M. D.

Genito-Urinary.

H. A. Fowler, M. D. Associates: M. A. Francis, M. D.; R. A. Hooe, M. D.; I. A. Pelzam, M. D.

Gynecological.

Wm. C. McNeil, M. D. L. A. Killingsworth, M. D.
 Associates: C. H. Marshall, M. D.; C. J. Young, M. D.

Orthopedics.

John Dunlop, M. D. Wm. G. Erving, M. D.
 John A. Talbot, M. D.
 Associate: C. A. Allen, M. D.

Pediatrics.

J. W. Mitchell, M. D. Marie B. Lucas, M. D.

Dermatology.

H. H. Hazen, M. D. Associates: C. C. Lathers, M. D.; J. W. Howard, M. D.

Tuberculosis.

J. T. Blue, M. D.

REPORT OF THE FREEDMEN'S HOSPITAL.

Washington, D. C., August 4, 1920.

SIR: I have the honor to present the annual report of the Freedmen's Hospital for the fiscal year ended June 30, 1920.

The year has been, to a large degree, one of readjustment, following the disorganization incident to the war. The professional staff has been practically restored to a prewar basis, so that the clinical work in the various departments of the hospital has gone on during the year uninterrupted and unhampered, except for the want of certain equipment.

At the request of the Vocational Education Board, and in accordance with the Rehabilitation Act, one disabled discharged soldier, a physician, was received for further training in abdominal diagnosis, X-ray work, and urology. It is a pleasure to note that this soldier has been greatly benefited, and the hospital has profited by his service.

There were many difficult problems arising from the labor situation, owing to its scarcity, inferior quality, and higher-wage demands. It is expected, however, that this condition will soon improve, a substantial increase of salaries having been provided for the fiscal year beginning July 1, 1920.

Other difficult problems arose during the year. The most perplexing among them, from an administrative view, was the increased cost of almost all necessities for hospital work. The current expenses were in excess of any sum ever expended. In providing sufficient for the urgent needs to keep the hospital in operation a deficit of \$9,408.63 was created, the second deficiency in 16 years. The third deficiency act, approved June 5, 1920, carried an appropriation sufficient to wipe out this deficit.

We are not facing the future in despair, but with high hopes of a gradual return to normal conditions when hospital work will be less burdensome and more efficient.

PATIENTS.

During the year five injured employees of the United States, beneficiaries of the Compensation Act, were admitted into this hospital for care and treatment on behalf of the United States Employees' Compensation Commission.

The total number of patients admitted into the hospital during the year was 3,714, or 138 less than the preceding year.

Of those admitted 867, including 82 births, were pay patients; 1,217, including 102 births, were United States indigents; and 1,630, including 151 births, were District of Columbia indigents.

At the beginning of the year there were remaining in the hospital 218 patients. These, with those admitted during the year, make a total of 3,906 indoor patients under care, as against 4,070 last year.

It will be noticed from the statistics presented elsewhere in this report that there was an increase of 136 United States indigent patients admitted over last year, while there were 192 less from the District of Columbia and 92 less pay patients.

The receipts from pay patients amounted to \$21,664.50, exceeding last year's receipts by \$4,034.40, or seven times more than the sum received in 1863, the year this service began.

There were discharged during the year 3,745, of whom 1,830 had recovered, 1,353 improved, 252 unimproved, 47 not treated, and 263 died.

The surgical work shows an increase over the preceding year, there being 2,016 operations performed, as against 1,940, with very gratifying results.

In the out-patient department 6,393 were treated, or 1,058 more than last year as follows: Medical, 881; minor surgical, 787; neurological, 121; orthopedical, 176; pediatrical, 370; dermatological, 295; tuberculosis, 19; otorhinological, 853; urological, 408; gynecological, 814, and ophthalmological, 1,669.

There were 12,314 revisits to the various clinics of this department, of which number 2,590 were for surgical dressings.

The total number of indoor and outdoor patients receiving the benefits of the hospital was 10,299, as against 9,405 the preceding year.

Patients admitted each year ending June 30 for the past 46 years.

1875.....	190	1891.....	2,373	1907.....	2,366
1876.....	319	1892.....	2,331	1908.....	2,669
1877.....	500	1893.....	2,422	1909.....	2,590
1878.....	519	1894.....	2,801	1910.....	2,740
1879.....	642	1895.....	2,476	1911.....	2,900
1880.....	819	1896.....	2,596	1912.....	3,385
1881.....	892	1897.....	2,815	1913.....	3,208
1882.....	1,102	1898.....	2,355	1914.....	3,144
1883.....	1,373	1899.....	2,374	1915.....	3,348
1884.....	1,509	1900.....	2,427	1916.....	3,491
1885.....	1,794	1901.....	2,414	1917.....	3,886
1886.....	1,923	1902.....	2,408	1918.....	3,648
1887.....	2,017	1903.....	2,677	1919.....	3,852
1888.....	1,997	1904.....	2,797	1920.....	3,714
1889.....	2,074	1905.....	2,918		
1890.....	2,392	1906.....	2,207		

STATISTICAL TABLES.

INDOOR SERVICE.

The following tables show, in classified detail, the number of medical and surgical cases admitted, discharged, diagnosis, operations, and results of the indoor patients.

Medical and surgical diseases.

EXCEPT PAY PATIENTS.

Disease.	Remaining July 1, 1910.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1910.	
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.				
		Male.	Female.	Male.	Female.											
<i>Abcesses, infections, ulcers.</i>																
<i>Abcesses:</i>																
Alveolar.....				1	1	2		2				2	23	16		
Bartholinian.....					5	5	4	1				5	77	15		
Breast.....					1	1		1				1	7	7		
Chest.....				1	1	2	1	1				2	26	14		
Eye.....				1		1		1				1	6	6		
Face.....				1		1		1				1	18	13		
Ischio-rectal.....				3	1	4	1	2				3	19	6	1	
Lumbar.....					1	1		1				1	19	19		
Neck.....				1		1	1					1	9	9		

Medical and surgical diseases—Continued.

EXCEPT PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1919.	Admitted.				Total.	Discharged.						Total.	Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.
		White.		Colored.			Recovered.	Improved.	Unimproved.	Not treated.	Died.					
		Male.	Female.	Male.	Female.											
<i>Abcesses, infections, ulcers—Continued.</i>																
<i>Abcesses—Contd.</i>																
Palmar.....					2	2		2				2	48	24		
Parotid.....				1		1		1				1	17	17		
Peri-rectal.....					3	3	2	1				3	36	12		
Peritonsillar.....				5	5	10	4	3	1		2	10	79	7		
Post-nasal.....				1		1		1				1	4	4		
Retropharyngeal.....					1	1		1				1	2	2		
Shoulder.....				1		1		1				1	81	81		
Spine.....					1	1			1			1	14	14		
Submaxillary.....					2	2		2				2	22	11		
Thigh.....				3	1	4		3				3	99	33	1	
<i>Infections:</i>																
Arm.....				1		1					1	1	82	82		
Breast.....					3	3	1	2				3	87	29		
Finger.....				2		2		2				2	82	41		
Frontal sinus.....	1			1	2	4		4				4	325	81		
Hand.....	1			4	2	7	2	4			1	7	186	26		
Knee.....				1		1		1				1	3	3		
Neck.....				3		3	1	2				3	77	25		
Toe.....			1			1		1				1	1	1		
<i>Ulcers:</i>																
Foot.....				1		1		1				1	128	128		
Leg.....				2	3	5	1	3	1			5	135	27		
Perineal.....					1	1		1				1	3	3		
Rectal.....				1	1		1	1				2	21	10		
<i>Bones and joints.</i>																
Ankylosis, elbow.....	1					1		1				1	26	26		
<i>Arthritis:</i>																
Gonorrheal.....	3			4	10	17	2	13			1	16	670	41	1	
Infectious.....				4	2	6	2	4				6	105	17		
Rheumatic.....	5			2	7	14		14				14	443	31		
Syphilitic.....				5	4	9	1	5				6	227	37	3	
Traumatic.....				3	1	4	2	2				4	128	32		
Bone cyst.....					1	1		1				1	18	18		
Bursitis.....					4	4	1	3				4	110	27		
<i>Deformity:</i>																
Pelvo-congenital.....				1		1		1				1	30	30		
Pes planus.....				2	1	3	2	1				3	90	30		
<i>Dislocation:</i>																
Clavicle.....				1		1		1				1	10	10		
Elbow.....				1		1		1				1	13	13		
Hip.....				2	2	4		2	1			3	26	8	1	
Knee.....				1		1		1				1	41	41		
Shoulder.....				3		3	2					2	12	6	1	
<i>Exostosis, floating semilunar.....</i>				1		1		1				1	3	3		
<i>Cartilage:</i>																
Fracture:																
Acromion.....				1	1	2		2				2	42	21		
Clavicle.....				5		5	2	2				4	53	13	1	
Femur.....	3			6	6	15	3	6	1		2	12	512	42	3	
Fibula.....				4	5	9	4	5				9	340	37		
Humerus.....				5	1	6		3	1			4	49	12	2	
Mandible.....				2		2	1	1				2	26	13		
Metatarsal.....				4		4	1	3				4	77	19		
Pelvis.....	1			1		2		2				2	146	73		
Radius.....				3	1	4	1	1	1			3	10	3	1	
Rib.....				3	1	4		3			1	4	23	5		
Skull.....	1	1		2		4	2	1			1	4	76	19		
Tibia.....	1			13	2	16	3	13				16	657	41		
Ulna.....				4		4	2	2				4	70	17		
<i>Osteoarthritis.</i>				1	3	4		4				4	170	42		
<i>Osteomyelitis:</i>																
Femur.....				1		1	1					1	102	102		
Humerus.....				1		1	1					1	80	80		
Maxillary.....	1					1		1				1	27	27		
Metatarsal.....				2		2	1	1				2	68	34		
Sternum.....				1		1		1				1	18	18		
Tibia.....		1		2	1	4		1				1	23	23		

Medical and surgical diseases—Continued.

EXCEPT PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1916.	Admitted.				Total.	Recovered.	Discharged.					Total.	Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1916.
		White.		Colored.				Improved.	Unimproved.	Not treated.	Died.					
		Male.	Female.	Male.	Female.											
Bones and joints—Con.																
Periostitis				4	2	6		6				6	266	42		
Sprain:																
Ankle				1	2	3	1	2				3	17	5		
Knee				1		1		1				1	5			
Shoulder				1		1		1				1	1	1		
Tuberculosis:																
Astragulus				1		1		1				1	23	23		
Hip	1			6		7		5	2			7	493	70		
Knee				4	1	5		3			2	4	199	49		1
Spine	1			6	4	11		10	1			11	3,516	319		
Circulatory system.																
Acute dilation, heart	1			2		3		1			2	3	117	39		
Aneurysm:																
Aortic				1	1	2		2				2	46	23		
Arteriovenous	1					1		1				1	18	18		
Arteriosclerosis	1			5	1	7		5			1	6	422	70		1
Cardiac decompensation	1	1		4	3	9		5			2	7	358	51	2	
Cerebral hemorrhage				1	1	2						2	1,049	976		
Endocarditis, acute					1	1		1				1	1	1		
Frost bite				3		3		3				3	69	23		
Gangrene, foot				4		4	2						264	81		1
Hemorrhoids				9	7	16	10	5	1			16	317	19		
Hypertension	2			1	5	8	1	5			1	7	92	13		1
Myocarditis				1	6	7		3			3	6	375	62		1
Pericarditis				1		1	1					1	76	76		
Valvular diseases:																
Aortic insufficiency				8	2	10		4	2		4	10	262	26		
Mitral insufficiency	1			4	12	17		12			5	17	453	26		
Mitral stenosis				1	1	2					1	1	26	26	1	
Tricuspid regurgitation				1		1		1				1	3	3		
Varicose ulcer	1			3	2	6	1	4	1			6	476	76		
Constitutional diseases.																
Anemia:																
Pernicious				2		2			1		1	2	88	44		
Secondary				1	1	2		2				2	11	5		
Diabetes:																
Mellitus				3	9	12	1	5			6	12	356	29		
Insipidus	1					1		1				1	53	53		
Inanition				2	2	4		1			2	3	16	5	1	
Malnutrition				4	5	9	2	6			1	9	239	26		
Marasmus	2			1	2	3					3	5	129	25		
Rickets	1			2		3		2			1	3	242	80		
Digestive system.																
Appendicitis:																6
Acute	1			20	16	37	19	3			9	31	533	17		
Chronic	1			16	25	42	25	13	3		1	42	786	18		
Autointoxication	1			3	5	9	4	3	1			8	52	6	1	
Dysentery, bacillary				3	1	4		3				3	49	16	1	
Enteritis				4	7	11	3	6			2	11	55	7		
Fissure in ano	1			1		2		1	1			2	15	7		
Fistula in ano	1			5	12	18	5	9	3			17	382	22	1	
Gleason's disease					1	1		1				1	27	27		
Hernia:																
Epigastric				1		1	1					1	27	27		
Inguinal	1			35	4	40	29	3	2		4	38	872	23	2	
Umbilical				4	3	7	3	2	1		1	7	178	25		
Ventral	1					1	1					1	27	27		

*Medical and surgical diseases—Continued.***EXCEPT PAY PATIENTS—Continued.**

Disease.	Remaining July 1, 1919.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.	
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.				
		Male.	Female.	Male.	Female.											
<i>Digestive system—Con.</i>																
Intestinal obstruction				4	6	10	2	5			5	10	291	29		
Liver:																
Carcinoma				1	1	2		1	1			2	35	17		
Cholecystitis				1	5	6	4	2				6	134	22		
Cholelithiasis					1	1		1				1	1	1		
Cirrhosis	1			1		2		2				2	54	27		
Icterus neonatorum																
Icterus neonatorum				1		1					1	2	10	10		
Mouth:																
Cancer—																
Lip				1		1			1			1	4	4		
Tongue					1				1			1	11	11		
Ranula				2		2	1	1				2	27	13		
Pancreatitis, acute				1	1	2		1			1	2	22	11		
Peritonitis:																
Acute				1	2	3	2				1	3	123	41		
Tuberculous	1			1	2	4		2			1	3	90	30	1	
Rectum:																
Carcinoma				1		1		1				1	4	4		
Prolapse					2	2	1					1	176	176	1	
Stricture					2	2	1	1				2	43	21		
Stomach:																
Carcinoma				7	7	14		4	2		8	14	509	36		
Gastrectasis				1		1		1				1	10	10		
Gastric neurosis				1	1	2	1	1				2	24	12		
Gastric ulcer				3	2	5		5				5	92	18		
Gastritis—																
Acute				16	15	31	8	22			1	31	299	9		
Chronic				3	2	5	1	4				5	84	16		
Hyperchlorhydria				2	3	5		5				5	52	10		
<i>Eye, ear, nose, and throat.</i>																
Eye:																
Astigmatism	1					1		1				1	20	20		
Cataract				2	4	6	1	4	1			6	346	57		
Choked disk				1		1		1				1	40	40		
Conjunctivitis				2	4	6	2	3				5	148	29	1	
Corneal ulcer				2	2	4	1	3				4	45	11		
Glaucoma	1				1	2		2				2	232	116		
Iridocyclitis				3		3		3				3	130	40		
Iritis-syphilitic					1	1		1				1	11	11		
Keratitis-interstitial																
tial	1					1		1				1	241	241		
Optic atrophy				5	1	6		2	4			6	104	17		
Panophthalmitis					1	1		1				1	88	88		
Pterygium				1		1		1				1	2	2		
Retinitis—																
Albuminuric				1		1		1				1	14	14		
Specific					1	1	1					1	45	45		
Ear:																
Mastoiditis				1		1		1				1	15	15		
Otitis media				5	6	11	2	6	2		1	11	284	26		
Rupture, tympanic membrane				1		1	1					1	5	5		
Nose:																
Hypertrophied				1		1		1				1	7	7		
Nasal polypus					1	1	1					1	32	32		
Rhinitis, acute				4	5	9	6	3				9	102	11		
Throat:																
Hypertrophied tonsils	1	1		79	61	142	84	35	21		1	142	903	6		
Laryngitis				2	1	3	2	1				3	34	11		
Pharyngitis	1			1	1	3		3				3	22	7		
Tonsillitis				7	12	19	3	16				19	212	11		

Medical and surgical diseases—Continued.

EXCEPT PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1910.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.	
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.				
		Male.	Female.	Male.	Female.											
Genito-urinary system.																
Acute urinary retention.....				4		4	3					3	12	4	1	
Atomy of bladder.....				1		1		1				1	1	1		
Carcinoma of bladder.....	1					1					1	1	19	19		
Carcinoma of penis.....				2		2		2				2	101	50		
Chancreoid.....	4			27	1	28	8	23				30	963	32	2	
Cystitis.....				2	9	11	4	5	1			10	211	21	1	
Dyspareunia.....					1	1		1				1	1	1		
Elongated prepuce.....	1			43		44	27	11	5			43	480	11	1	
Epididymitis.....				13		13		11	1			12	201	16	1	
Hydrocele:																
Canal of nank.....					1	1	1					1	20	20		
Tunica vaginalis.....	1			3		4	2	1	1			4	37	9		
Hypertrophy-labia majora.....					1	1		1				1	108	108		
Hypertrophied prostate.....	2			11		13	5	5			2	12	506	42	1	
Incontinence-urine.....				1		1	1					1	9	9		
Kidney:																
Nephritis—																
Acute.....	1			1	3	5	1	4				5	96	19		
Acute parenchymatous.....				3	3	6		2			4	6	69	11		
Chronic interstitial.....	1			9	21	31	1	13	6		10	29	610	21	2	
Chronic parenchymatous.....	1			3	3	7		3			4	7	177	25		
Renal calculi.....				5	1	6		3	2			5	54	10	1	
Tuberculosis.....				2	1	3		3				3	142	47		
Oorchitis.....	1			4		5	2	3				5	25	5		
Paraphimosis.....				7		7	4	2	1			7	91	13		
Phimosis.....	1			19		20	11	6	3			20	312	15	2	
Plegmon of scrotum.....	2			4		6	2	3			3	8	232	29		
Prostatitis.....				3		3		3				3	53	17		
Stricture, urethra.....	1			15		16	2	12	2			16	147	9		
Tuberculosis:																
Prostate.....				1		1		1				1	1	1		
Testicle.....				1		1		1				1	5	5		
Urethritis, gonorrheal.....	2			22	4	28	9	18	1			28	495	17		
Uremia.....				2	7	9					9	9	77	8		
Varicocele.....				1		1	1					1	10	10		
Gynecological.																
Abortion:																
Complete.....					26	26	16	6	1		2	25	336	13	1	
Incomplete.....	2				15	17	14	1	1		1	17	208	12		
Threatened.....					5	5	2	3				5	49	9		
Carcinoma:																
Cervix uteri.....					11	11		2	5		2	9	132	14	2	
Corpus uteri.....					2	2			1		1	2	99	49		
Ectopic gestation.....					7	7	6				1	7	180	26		
Endometritis.....	1				19	20	15	3			1	19	374	191		
Fibroma uteri.....	6				73	79	54	10	4		4	72	1,909	26	7	
Hydrosalpinx.....	1				1	2		2				2	52	26		
Lacerated perineum.....	1				11	12	8	3				11	238	21	1	
Menstrual disorders:																
Amenorrhea.....					1	1		1				1	18	18		
Dysmenorrhea.....					6	6	2	4				6	40	6		
Menorrhagia.....					1	1		1				1	8	8		
Metrorrhagia.....					5	5	3	2				5	32	6		
Ovary:																
Cystic.....	1				19	20	13	3	1			17	488	28	3	
Sarcoma.....					1	1	1					1	27	27		
Postoperative adhesions.....					15	15	2	10	3			15	215	14		
Procidencia.....					1	1	1					1	35	35		
Pyosalpingitis.....	2				23	25	19	5	1			25	492	19	3	
Retroverted uterus.....					8	8	4	2	2			8	123	15		
Salpingitis.....	3				112	115	53	43	12			108	1,940	18	7	
Sarcoma cervix uteri.....					1	1						1	10	10		
Subinvolution.....					2	2		2				2	25	12		
Tubo-ovarian abscess.....					12	14	10	4				14	331	23		
Vaginitis.....					1	1		1				1	26	26		

Medical and surgical diseases—Continued.

EXCEPT PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1916.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1916.	
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.				
		Male.	Female.	Male.	Female.											
<i>Infectious diseases.</i>																
Cerebrospinal meningitis					1	1					1	1	2		2	
Chicken pox					1	1					1	1	104	104		
Chorea	1				1	2		1			1	2	70	35		
Encephalitis lethargica				3		3		2			1	3	58	19		
Endocarditis	1			3		4		2			2	4	133	33		
Erysipelas				1		1					1	1	39	39		
Influenza				30	10	40	19	18			3	40	638	15		
Malaria					1	1		1				1	51	51		
Parotitis					1	1		1				1	12	12		
Pellagra					1	1					1	1	3	3		
Pertussis				1	1	2		2				2	19	8		
Pneumonia:																
Broncho	4			12	6	22	5	5	2		10	22	319	14		
Lobar				18	11	29	7	5	1		15	28	478	16	1	
Rheumatic fever	2			5	11	18	5	12				18	668	35		
Syphilis:																
Cerebral	1			7	4	12		5	3		3	11	607	55	1	
Congenital				7	5	13	2	6	1		3	12	306	22	1	
Primary	2			11		13	1	10	2			13	477	36		
Secondary	2			31	31	64	10	42	3		4	59	1,570	26	5	
Tertiary				10	4	14		11	1		2	14	326	23		
Tetanus					2	2		1			1	2	46	23		
Tuberculosis	1			9	12	22		5	13		3	21	534	25	1	
Typhoid fever				8	6	14	6	6	2			14	663	33		
Vaccina				1		1		1				1	3	3		
<i>Injuries.</i>																
Burn:																
Arm	1					1		1				1	93	93		
Body				4	2	6	1	1			2	4	24	6	2	
Chest				1	1	2		1			1	2	47	23		
Legs				1	1	2	1					1	23	23	1	
Foreign body:																
Ear					1	1	1					1	1	1		
Foot				1		1	1					1	23	23		
Popliteal space				1		1	1					1	18	18		
Stomach				1		1			1			1	5	5		
Rape					1	1		1				1	2	2		
Shock		1		7	4	12	3	8			1	12	63	5		
Wounds:																
Abrasion				2		2	1	1				2	15	7		
Contusion				9	12	21	3	16				19	124	6	2	
Gunshot	1			18	6	25	3	16	3		1	23	269	11	2	
Incised				1	2	3		2				2	3	1	1	
Lacerated	1			26	7	34	8	22	2		2	34	313	9		
Punctured				3	1	4		4				4	24	6		
Sprain					2	2	1	1				2	42	21		
Strain				4	4	8	2	5				7	120	17	1	
<i>Lymphatic system.</i>																
Adenitis:																
Axillary					1	1		1				1	38	38		
Cervical	1				8	17	6	8				14	188	12	3	
Inguinal	0			36	14	50	17	32	5			54	1,144	21	2	
Elephantiasis:																
Leg				1		1		1				1	26	26		
Vulva					1	1		1				1	56	56		
Lymphangitis				1		1		1				1	19	19		
<i>Nervous system.</i>																
Angioneurotic edema				1		1	1					1	33	33		
Aphasia				1		1		1				1	7	7		
Cerebral concussion	1			6	2	9	4	5				9	48	5		
Cerebral tumor				1		1					1	1	16	16		
Dementia				2	1	3		2			1	3	82	27		
Dementia precox					1	1		1			1	1	30	30		
Epilepsy	1	1		8	2	12		10	1			11	148	13	1	
Hemiplegia	1			3	1	5		3	1		1	5	587	116		
Hypochondriasis				1		1		1				1	14	14		

Medical and surgical diseases—Continued.

EXCEPT PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1910.	Admitted.				Total.	Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.	
		White.		Colored.			Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.				
		Male.	Female.	Male.	Female.											
Nervous system—Con.																
Hysteria.....				1	6	7	3	4			7	90	12			
Locomotor ataxia.....	3			3		6		4	1	1	6	561	90			
Migraine.....				3	1	3	2	1			3	29	13			
Neuralgia.....				3	6	9	1	6			7	85	12	2		
Neurasthenia.....	1	1		4	6	12	2	8	2		12	369	30			
Paranoia.....				1	1	2		1			1	12	12	1		
Obstetrical.																
Births:				125	128	253	238			7	245	3,695	15	8		
Living.....																
Remaining.....	9					9	9				9	65	7			
Babies with mother.....				1	2	3				3	3	35	11			
Pregnancy:																
Delivered.....	11				297	308	294			7	301	6,600	21	7		
Undelivered.....	1				46	47			42		42	289	6	5		
Puerperal sepsis.....					9	9	3	3		3	9	158	17			
Puerperium.....					4	4	4				4	53	13			
Stillbirths.....				24	18	42										
Poisoning.																
Alcohol:																
Grain.....	1	3		7		11	4	5	1	1	11	258	28			
Wood.....		1		1		2		1		1	2	3	1			
Asphyxiation.....				3	2	5	2	2			5	34	6			
Crocote.....					1	1	1				1	4	4			
Heat exhaustion.....				1		1		1			1	1	1			
Iodine.....					2	2	1	1			2	13	6			
Mercurialism.....				1	1	2	2				2	7	3			
Morphine.....				1	1	2	1		1		2	4	2			
Ptomaine.....					1	1	1				1	11	11			
Respiratory system.																
Abscess of lung.....					1	1			1		1	4	4			
Asthma.....				18	4	22		21			21	140	6	1		
Bronchitis:																
Acute.....				11	18	29	19	8			27	209	7	2		
Chronic.....				3	3	6	1	5			6	301	50			
Empyema.....				4		4			2	2	4	238	59			
Pleurisy:																
Plastic.....				4	1	5	1	4			5	176	35			
Sero-fibrinous.....					1	1		1			1	13	13			
With effusion.....					2	2	1	1			2	49	24			
Respiratory paralysis.....				1		1				1	1	2	2			
Skin.																
Carus.....				1	1	1	1				1	4	4			
Eczema.....				2		2	2				2	53	26			
Herpes zoster.....				2		2		2			2	16	8			
Impetigo.....	1			1		2		2			2	60	30			
Urticaria.....					1	1	1				1	10	10			
Tumors.																
Breast:																
Carcinoma.....	1				9	10	1	7			8	266	33	2		
Sarcoma.....					1	1		1			1	26	26			
Epithelioma finger.....				1	1	2	1	1			2	29	14			
Fibroma fascialata.....				1		1		1			1	40	40			
Fibroma leg.....	1					1		1			1	27	27			
Goitre:																
Cystic.....					4	4	2	1	1		4	86	21			
Parenchymatous.....	1				4	5	1	3			4	102	25	1		
Lipoma.....				2	2	4	3	1			4	41	10			
Sarcoma thigh.....				2		2	1	1			2	44	22			
Sebaceous cyst.....				1		1	1				1	10	10			
Undiagnosed.....	6			4	3	13	2	5	3	1	11	157	14	2		
Total.....	149	10	1	1,279	1,557	3,003	1,326	1,066	210	5	214	2,821		133		

Medical and surgical diseases—Continued.

PAY PATIENTS.

Disease.	Remaining July 1, 1919.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
		Male.	Female.	Male.	Female.										
Abortion					1	1			1			1	3	3	
Abcess:															
Abdominal wall					1	1		1				1	18	18	
Alveolar					2	2	1	1				2	10	5	
Axilla	1					1		1				1	13	13	
Pelvic					2	2		2				2	29	14	
Ischio-rectal					2	2	2	2				4	48	12	
Thigh					2		2	1				1	2	2	1
Acute urinary retention					1	1		1				1	37	37	
Adenitis:															
Axillary					1	1	1					1	7	7	
Inguinal	1				1	3	2	1				3	29	9	
Adenoma breast						3	3	2	1			3	33	11	
Adeno-sarcoma neck					1				1			1	5	5	
Alcoholism					2		2	1	1			2	30	15	
Appendicitis:															
Acute	1				7	4	12	3	4		3	10	181	18	2
Chronic	1				12	14	27	19	9			27	426	15	
Arthritis:															
Gonorrheal					4	1	5	1	3	1		5	93	5	
Infectious					4	1	5	2	3			5	310	62	
Rheumatic					1	3	4		4			4	48	12	
Traumatic						1	1		1			1	18	18	
Asthma					2		2		2			2	2	2	
Atelectasis					1		1				1	1	2	2	
Atresia-posterior nares						1	1		1			1	4	4	
Aural polypus						1	1		1			1	15	15	
Births	4				34	47	85	81			4	85	1,018	11	
Bronchitis, acute					4	4	2	2				4	38	9	
Bursitis-prepatellar					1		1	1				1	35	35	
Caruncle					1		1	1				1	11	11	
Carcinoma:															
Breast						4	4		4			4	93	23	
Cervix						6	6	1	2	1		6	87	14	
Mediastinum						1	1				1	1	16	16	
Shoulder						1	1		1			1	29	29	
Sigmoid						1	2	3			1	3	51	17	
Stomach						1	3	4		3	1	4	126	31	
Cholecystitis	1				2		3	3				3	84	28	
Cholelithiasis					1	1	2	2				2	34	17	
Constipation					1	2	3	2	1			3	15	6	
Cyst bone						2	2		2			2	117	58	
Cystic ovary	2				9		11	10	1			11	207	18	
Cystitis					1	1	2		2			2	42	21	
Diabetes mellitus						1	1	1				1	1	1	
Dislocation:															
Hip					1		1		1			1	14	14	
Shoulder						1	1		1			1	20	20	
Eclampsia:															
Post partum						1	1	1				1	7	7	
Puerperal						3	3		1		2	3	16	5	
Ectopic gestation						3	3	3				3	47	15	
Eczema					1		1	1				1	21	21	
Elongated prepuce					3		3	1	1			2	7	3	1
Endocarditis						5	5	2	2	1		5	44	8	
Endometritis						7	7	6				7	92	13	
Enteroptosis						1	1		1			1	13	13	
Epididymitis	1				1		2		2			2	16	8	
Eustachian salpingitis					1		1	1				1	5	5	
Fibroma uteri	5					69	74	54	10	2	5	71	1,210	17	3
Fistula-in-ano					2	2	4	2				4	52	12	
Fistula, umbilical						1	1	1				1	27	27	
Fracture:															
Femur					1	1	2		2			2	13	6	
Humerus						1	1				1	1	8	8	
Radius						1	1	1				1	6	6	
Rib					1		1		1			1	7	7	
Skull		1					1	1				1	14	14	
Tibia					2		2		2			2	8	4	
Gangrene, diabetic						1	1		1			1	24	24	
Gastric neurosis					1		1	1				1	20	20	

Medical and surgical diseases—Continued.

PAY PATIENTS—Continued.

Disease.	Remaining July 1, 1910.	Admitted.				Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.
		White.		Colored.		Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
		Male.	Female.	Male.	Female.									
Gastritis:				1	4	5		3			3	35	11	2
Acute.....				1	1	2		2			2	17	8	
Chronic.....														
Gonorrhea-parenchymatous.....	1				4	5	4	1			5	74	14	
Harelip, congenital.....					1	1	1				1	43	43	
Hematuria, essential.....				1		1		1			1	7	7	
Hemiplegia.....				3	2	5		2		1	3	46	16	2
Hemorrhoids:														
External.....				4	2	6	4	1			5	47	9	
Internal.....				4	1	5	4	1			5	49	9	
Mixed.....				2		2	2				2	25	12	
Hernia:														
Inguinal.....	1			16	4	21	16	3	2		21	407	19	
Umbilical.....					1	1		1			1	14	14	
Ventral.....					1	1	1				1	15	15	
Hydrocele.....				3		3	2		1		3	34	11	
Hyperemesis-gravidarum.....					2	2		2			2	18	9	
Hypertension.....				1	2	3		1	1	1	3	30	10	
Hypertrophic dilation colon.....				1		1				1	1	13	13	
Hypertrophy:														
Breast.....					1	1	1				1	12	12	
Prostate.....	1			4		5		3	1		4	94	23	1
Tonsils.....				47	41	88	53	24	9		86	232	2	2
Inanition.....				1	1	2		1		1	2	10	5	
Infection:														
Abdominal wound.....					1	1		1			1	58	58	
Hand.....					1	1		1			1	8	8	
Thigh.....				1		1	1				1	10	10	
Influenza.....				4	5	9	5	2		2	9	94	10	
Intestinal obstruction.....				1	3	4	2	1		1	4	68	17	
Laceration:														
Abdomen.....				1		1	1				1	10	10	
Cervix.....					3	3	2	1			3	50	16	
Perineum.....					2	2	1	1			2	47	23	
Lypema:														
Arm.....					1	1		1			1	1	1	
Back.....					3	3	3				3	28	9	
Mastitis.....					1	1		1			1	12	12	
Mastoiditis.....				1	1	2		2			2	33	16	
Melancholia.....	1			1		2		2			2	30	15	
Menorrhagia.....					1	1	1				1	7	7	
Mitral insufficiency.....					3	3		2		1	3	120	40	
Mucous colitis.....				1		1	1				1	14	14	
Myocarditis.....				1		1				1	1	2	2	
Nephritis:														
Acute.....				1	1	2	1			1	2	26	13	
Chronic interstitial.....	3			3	3	9		3		5	8	345	43	1
Chronic parenchymatous.....					3	3		1		1	2	43	21	1
Neurasthenia.....	1			3	6	10	4	6			10	153	15	
Oedema, glottis.....				1		1		1			1	1	1	
Optic atrophy.....					1	1		1			1	10	10	
Osteomyelitis:														
Finger.....				1		1		1			1	26	26	
Mandible.....					1	1	1				1	23	23	
Radius.....	1				1	1		1			1	28	28	
Tibia.....					1	1		1			1	12	12	
Otitis media.....					1	1		1			1	3	3	
Pericolic adhesions.....					1	1	1				1	27	27	
Pharyngitis.....				1		1		1			1	7	7	
Phimosi.....				3		3	1	2			3	9	3	
Phlebitis.....				1		1		1			1	27	27	
Placenta previa.....					2	2	1			1	2	21	10	
Pleurisy.....	1			1	1	3	1	2			3	42	14	
Pneumonia:														
Broncho.....				1	2	3	1			2	3	56	18	
Lobar.....				4	3	7	3	1		3	7	89	12	
Post operative adhesions.....				3	2	5	1	4			5	34	6	
Pregnancy.....	5				91	96	79	6	10		96	1,257	6	
Procidencia.....					2	2	1	1			2	26	13	

Medical and surgical diseases—Continued.

PAY PATIENTS—Continued

Disease.	Remaining July 1, 1919.	Admitted.					Discharged.						Total number of days in hospital.	Average number of days in hospital.	Remaining July 1, 1920.
		White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Not treated.	Died.	Total.			
		Male.	Female.	Male.	Female.										
Prostatitis.				1		1		1				1	5	5	
Ptomain poisoning.			1			1		1				1	2	2	
Pylorospasm.				1		1			1			1	3	3	
Renal calculi.				1		1		1				1	19	19	
Retained secundines.					1	1		1				1	11	11	
Salpingitis.	5			48		53	34	14	1		1	50	94	19	3
Smallpox.				1		1						1	4	4	
Stricture.															
Rectum.				1	1	2		2				2	29	14	
Urethra.				2		2	1	1				2	11	5	
Syphilis:															
Primary.				5	1	6		6				6	53	8	
Secondary.				5	4	9		7	1			8	114	14	1
Tertiary.				4		4		2		1		3	117	39	1
Talipes equino-varus.				1		1		1				1	14	14	
Tonsillitis.				1	5	6	2	2	1			5	46	9	
Tuberculosis:															
Knee.				1		1		1				1	28	28	
Pleura.					1	1			1			1	5	5	
Pulmonary.				3	2	5		1	2		1	4	99	24	1
Spine.				2	1	3		3				3	55	18	
Typhoid fever.				1	1	2	2					2	64	32	
Uter:															
Duodenal.	1					1	1					1	61	61	
Finger.					1	1		1				1	1	1	
Leg.				2	2	4		1	3			4	89	22	
Rectal.	1			1	1	3		1	2			3	61	20	
Uremia.				1	1	2					2	2	4	2	
Varicose veins.				1	1	2			1			1	1	1	1
Vulvo vaginitis.	1					1	1					1	17	17	
Wound:															
Burns.				1	2	3		2				2	33	11	1
Contusions.				1		1		1				1	1	1	
Sprains.				1	3	4	1	3				4	30	7	
Stab wound.				3		3		1				1	2	2	
Use of operating room.				17	2	19				19					
X ray.	1			10	6	17				17					
Undiagnosed.	3			2	1	6				6					
Total.	43	2	1	318	546	910	483	266	42	42	49	882			27

Operations and results, all patients.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Adenectomy.....	Adenitis:									
	Axillary.....				2	2	2			
	Cervical.....			10	10	20	5	14	1	
	Inguinal.....			30	5	35	22	12	1	
	Submental tuberculous.....			2		2		2		
Adenoidectomy.....	Adenoids.....	1	108	115		224	208	15		1
Amputations:										
Arm.....	Gangrene, right hand.....		1			1				1
Breast.....	Benign cystic tumor.....				1	1	1			
	Parenchymatous hypertrophy.....				1	1	1			
	Mastitis.....				2	2	2			
Cervix.....	Carcinoma.....				5	5		2	2	1
	Elongated.....				4	4		3	1	
Finger.....	Gangrene (diabetic).....			3		3	2	1		
	Infected.....			1	2	3	2	1		
	Osteomyelitis.....			1	1	2	1			
	Masseration.....				3	3	2	1		

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Amputations—Continued.										
Leg.....	Fracture.....			3		3	3			
	Gangrene.....			3	2	5	3	1		1
	Infected.....			1		1	1			
	Osteomyelitis.....			1		1	1			
Penis.....	Carcinoma.....			1		1		1		
Rectum.....	Prolapse.....			1	1	2	1			
Toes.....	Gangrene.....			1		1	1			
	Fracture.....			1		1	1			
	Maceration.....			1		1				1
Arthrectomy.....	Tuberculosis (knee).....			2	3	5		5		
Arthrotomy.....	Unreduced dislocation (shoulder).....				1	1		1		
Aspiration.....	Pleurisy with effusion.....			2		2				2
Canthoroplasty.....	Corneal ulcer.....			1	1	2	1	1		
	Corneal ulcer (perforating).....			1		1		1		
Cauterisation:										
Cervix.....	Carcinoma.....			1		1		1		
	Chanore.....			1		1		1		
Finger.....	Epithelioma.....				1	1	1			
Foot.....	Traumatic ulcer.....				1	1		1		
Leg.....	Epithelioma.....			1		1		1		
Rectum.....	Condylomata.....			1		1	1			
	Ulcers.....			3		3	1	2		
Coelotomy:										
Appendicectomy.....	Appendicitis:									
	Acute.....			8	7	15	10	5		
	Chronic.....			26	159	185	155	20		10
	Gangrenous.....			3		3	1			2
	Perforated.....			3		3	2			1
	Subacute.....			4	7	11	10	1		
	Suppurative.....			4	1	5	3			2
Caesarian section.....	Contracted pelvis.....			4	5	9	4			2
	Eclampsia.....			4	4	8	2			
	Fibroma uteri.....			2	2	4	2			
	Placenta previa.....				3	3	2			1
Cholecystotomy.....	Cholelithiasis.....			1	2	3	3			
	Cholecystitis:									
	Acute.....				1	1	1			1
	Chronic.....				1	1	1			
	Pancreatitis.....			1	1	2	1	1		
	Pericholecystitis.....				1	1				
Colotomy.....	Hirschsprung's disease.....			1		1				
Colostomy.....	Carcinoma, rectum.....			1		1		1		
Cystoscopy.....	Carcinoma, bladder.....			2	3	5		3	2	
Enterostomy.....	Intestinal obstruction.....			1	1	2				2
	Carcinoma of mesentery.....			1		1				1
Enterorrhaphy.....	Perforation ileum (typhoid).....			2		2	2			
Exploratory.....	Fracture of skull (linear).....	1		2		3	1			
	Carcinoma:									
	Stomach.....			1	1	2			1	1
	Uterus.....				2	2			2	
	Liver (inoperable gummas).....			1	2	3			2	
	Post operative adhesions.....			1		1	1			
	Pregnancy.....			2	2	4	1	1		
	Sarcoma, ovary.....				2	2			1	
	Strangulated hernia.....			1		1				1
	Splenic flexure (carcinoma of).....			1		1				1
	Retro peritoneal sarcoma.....			1		1	1			
Freeing of adhesions.....	Tuberculous peritonitis.....				2	2			2	
Fulguration.....	Ovarian adhesions.....				2	2	1	1		
	Obstruction (intestinal).....			2	2	4	3	1		
	Carcinoma of penis.....			1		1		1		
Gastro-enterostomy (posterior).....	Carcinoma.....			1		1				1
	Fylonic ulcer of stomach.....				2	2		1	1	
	Sarcoma.....				1	1			1	
Hysterectomy (pan) supra vaginal.....	Carcinoma of cervix.....				1	1	1			
	Fibroma uteri.....			3	3	6	3			
	Procidencia completa.....			1	1	2	1			
	Syphilitic uterus.....			1	1	2				
	Retroverted uterus.....			2	2	4	2			
Hysterectomy.....	Fibroma uteri.....			24	5	29	20	1		8
	Fibroma uteri and salpingitis.....			5		5	2	1		2
	Ectopic pregnancy.....			1		1	1			
	Myo fibroma uteri.....			1		1		1		
	Metritic uterus.....			1		1	1			

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Coeliotomy—Continued. Hystero-oophorectomy..	Fibroid uterus and ovarian cyst.	.....	.....	.....	3	3	2	1	.....	.....
	Tubo-ovarian abscess.	.....	.....	.....	3	3	3	.....	.....	.....
	Fibroma uteri multinodular.	.....	.....	.....	3	3	2	.....	.....	.....
	Infantile uterus, cystic ovaries.	.....	.....	.....	1	1	.....	1	.....	.....
Hystero-salpingectomy..	Fibroid uterus.	.....	.....	.....	4	4	4	.....	.....	.....
	Fibroid uterus pyrosalpinx.	.....	.....	.....	3	2	2	.....	.....	.....
	Fibroid uterus, pyrohydro-salpinx.	.....	.....	.....	1	1	1	.....	.....	.....
	Multinodular fibroma uteri.	.....	.....	.....	1	1	1	.....	.....	.....
Hystero-salpingo oophorectomy.	Pyo-salpingitis (bilateral).	.....	.....	.....	1	1	1	.....	.....	.....
	Syphilitic uterus.	.....	.....	.....	1	1	1	.....	.....	.....
	Cystic ovaries.	.....	.....	.....	3	3	2	1	.....	.....
	Cystic ovary and tubal pregnancy.	.....	.....	.....	1	1	.....	.....	.....	.....
	Fibroma uteri.	.....	.....	.....	61	61	46	12	3	.....
	Fibroma uteri with adhesions.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri cystic ovaries.	.....	.....	.....	4	4	4	.....	.....	.....
	Fibroma uteri, cystic ovary and salpingitis.	.....	.....	.....	3	3	3	.....	.....	.....
	Fibroma uteri and pyrosalpinx.	.....	.....	.....	2	2	2	.....	.....	.....
	Fibroma uteri, salpingo-oophoritis.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri, salpingo-oophoritis and cystic ovaries.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri, salpingitis.	.....	.....	.....	1	1	.....	1	.....	.....
	Metric uterus.	.....	.....	.....	2	2	2	.....	.....	.....
	Metric uterus and cystic ovary.	.....	.....	.....	1	1	1	.....	.....	.....
	Metric uterus and tubo-ovarian abscess.	.....	.....	.....	18	18	16	2	.....	.....
	Multinodular fibroma uteri.	.....	.....	.....	1	1	1	.....	.....	.....
	Intra mural fibroma uteri.	.....	.....	.....	2	2	1	1	.....	.....
	Multinodular fibroma uteri, hydro-salpinx.	.....	.....	.....	1	1	1	.....	.....	.....
	Myo-fibroma uteri, cystic ovary, salpingitis.	.....	.....	.....	2	2	2	.....	.....	.....
	Myo-fibroma complicated by pregnancy.	.....	.....	.....	1	1	1	.....	.....	.....
Hystero-bilateral-salpingo-oophorectomy.	Procidentia uteri.	.....	.....	.....	1	1	.....	1	.....	.....
	Pyo-salpinx (bilateral).	.....	.....	.....	2	2	1	.....	1	.....
	Pyo-salpinx and cystic ovaries.	.....	.....	.....	18	18	16	2	.....	.....
	Salpingitis.	.....	.....	.....	1	1	1	.....	.....	.....
	Salpingitis and cystic ovaries.	.....	.....	.....	13	13	11	2	.....	.....
	Sloughing submucous fibroma uteri.	.....	.....	.....	2	2	1	1	.....	.....
	Tubo-ovarian abscess.	.....	.....	.....	2	2	.....	2	.....	.....
	Cystic ovaries.	.....	.....	.....	5	5	4	1	.....	.....
	Cystic ovaries and tubal pregnancy.	.....	.....	.....	2	2	2	.....	.....	.....
	Fibroma uteri.	.....	.....	.....	20	20	16	3	1	.....
	Fibroma uteri, cystic ovaries.	.....	.....	.....	8	8	8	.....	.....	.....
	Fibroma uteri, hydro-salpinx.	.....	.....	.....	3	3	3	.....	.....	.....
	Fibroma uteri (intraligamentous) cystic ovary.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri, pyosalpinx.	.....	.....	.....	14	14	10	2	.....	2
	Fibroma uteri, pyosalpinx, cystic ovary.	.....	.....	.....	3	3	3	.....	.....	.....
	Fibroma uteri, salpingitis.	.....	.....	.....	4	4	3	.....	1	.....
	Fibroma uteri, salpingitis, cystic ovary.	.....	.....	.....	2	2	2	.....	.....	.....
	Fibroma uteri, salpingo-oophoritis.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri, tubo-ovarian abscess.	.....	.....	.....	1	1	1	.....	.....	.....
	Fibroma uteri, tuberculous salpingitis.	.....	.....	.....	1	1	1	.....	.....	.....
	Hydrosalpinx-cystic ovaries.	.....	.....	.....	1	1	1	.....	.....	.....
	Hydatidiform mole.	.....	.....	.....	1	1	1	.....	.....	.....

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Coeliotomy—Continued.	Infantile uterus, cystic ovary,				9	9	9			
Hystero-bilateral-salpingo-oophorectomy—Continued.	multinodular fibroma uteri.									
	Multinodular fibroma uteri, salpingitis, cystic ovary.				1	1	1			
	Multinodular fibroma uteri, cystic ovary.				4	4	1	3		
	Multinodular fibroma uteri, dermoid cyst.				1	1	1			
	Multinodular fibroma uteri, salpingitis.				2	2	2			
	Myo-fibroma uteri.				4	4	4			
	Pyosalpingitis.				3	3	3			
	Pyosalpingitis, cystic ovary.				6	6	4	2		
	Pyosalpingitis and infected uterus.				1	1	1			
	Pyosalpingitis and ovarian abscess.				2	2	2			
	Pyosalpingitis and oophoritis.				1	1	1			
	Metritic uterus, salpingitis and cystic ovary.				2	2	2			
	Metritic uterus and salpingitis.				4	4	3			1
	Salpingitis and cystic ovaries.				8	8	8			
	Salpingitis and ovarian abscess.				1	1	1			
	Salpingitis and oophoritis.				1	1	1			
	Tubo-ovarian abscess.				6	6	5	1		
	Tubo-ovarian abscess, cystic ovary.				1	1	1			
	Tubo-ovarian abscess (ruptured).				1	1	1			
	Tubo-ovarian abscess, metritic uterus.				1	1	1			
	Tubo-ovarian abscess and hematoma.				1	1	1			
	Tubo-ovarian abscess, salpingitis.				1	1	1			
	Tubal pregnancy, cystic ovary, fibroma uteri.				1	1	1			
	Tuberculous salpingitis and peritonitis.				1	1	1			
Myomectomy.	Fibroma uteri.				3	3	3			
	Fibroma uteri and salpingitis.				1	1	1			
Intestinal resection.	Pedunculated fibroma uteri.				3	3	2			1
Oophorectomy.	Intestinal obstruction.				1	1	1			
	Cystic ovary.				15	15	15			
	Ovarian cyst.				1	1	1			
	Oophoritis.				2	2	1			1
	Prolapsed ovary.				1	1	1			
	Tubo-ovarian abscess.				1	1	1			
Plastic.	Cystic ovary.				15	15	13	2		
Salpingectomy.	do.				4	4	4			
	Pyo-salpingitis.				15	15	15			
	Salpingitis.				1	1	1			
	Salpingitis and cystic ovary.				2	2	2			
	Salpingo oophoritis.				5	5	4	1		
Salpingo oophorectomy.	Cystic ovary.				1	1	1			
	Cystic ovary and hydrosalpinx.				1	1	1			
	Dermoid cyst of ovary.				4	4	3	1		
	Ectopic pregnancy (ruptured).				4	4	3			1
	Ectopic pregnancy.				2	2	2			
	Hemato salpingitis.				1	1	1			
	Ovarian cyst.				4	4	4			
	Pyosalpingitis.				5	5	4	1		
	Pyosalpingitis and cystic ovary.				1	1	1			
	Pyosalpingo-oophoritis.				3	3	2	1		
	Salpingitis.				25	25	25			
	Salpingitis and cystic ovaries.				16	16	10	6		
	Salpingitis and oophoritis.				1	1	1			
	Salpingo-oophoritis and metritic uterus.									

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Cosliotomy—Continued.	Tubo-ovarian abscess.....				3	3	3			
Salpingo oophorectomy—Continued.	Tubo-ovarian abscess and fibroma uteri.				1	1	1			
	Tubo-ovarian abscess, left pyosalpinx.				1	1	1			
	Varicocele of pampiniform plexus.				3	3	2	1		
Shortening of round ligament.	Anterverted uterus.....				1	1	1			
	Oophoritis.....				1	1	1			
	Retroverted uterus.....				3	3	3			
	Retroverted uterus, cystic ovary.				2	2	1	1		
Ventral suspension.	Retroverted uterus.....				4	4	3	1		
Circumcision.	Adherent prepuce.....				1	1	1			
	Chancroidal phimosis.....				18	18	12	6		
	Congenital phimosis.....				5	5	4	1		
	Exuberant granulations.....				1	1	1			
	Phimosis.....				17	17	15	2		
	Paraphimosis.....				3	3	3			
	Elongated prepuce.....				47	47	30	17		
	Venereal warts.....				1	1	1			
Colporrhaphy, anterior.	Cystocele.....				1	1	1			
	Procidential uteri.....				1	1	1			
Curettement.	Bacchoinian abscess.....				1	1	1			
	Endocervicitis.....				2	2	2			
	Endocervicitis and endometritis.....				1	1	1			
	Endometritis.....				32	32	26	6		
	Exuberant granulations of penis.....				1	1	1			
	Fracture of tibia.....				1	1	1			
	Frontal sinusitis.....				1	1	1			
	Fissure in ano.....				1	1	1			
	Hyperemesis gravidarum.....				2	2				1
	Infected burn.....				1	1	1			
	Inguinal adenitis.....				1	1	1			
	Osteomyelitis.....				2	1	1			
	Periostitis.....				1	3	4	1	3	
	Polypus (anal).....				1	1	1			
	Retained secundinea.....				16	16	13	1		2
	Syphilitic granulomata.....				1	1	1			
	Syphilitic necrosis (clavicle).....				1	1	1			
	Temporal abscess.....				1	1	1			
	Tuberculous sequestrum.....				1	1	1			
	Ulcer of leg.....				1	1	1			
Cauterization.	Ulcer of rectum.....				1	2	1	1		
	Carcinoma of cervix.....				3	3				1
	Carcinoma of breast.....				2	2				
	Rectal ulcer.....				2	2	3	1	2	
	Urethral caruncle.....				1	1	1			
Decompression.	Fracture of skull.....				1	1	1			
Dilation.	Atresia of nares.....				1	1	1			
	Coccygeal abscess of fissure.....				1	1	1			
	Dead foetus in utero.....				1	1				1
	Endocervicitis.....				1	1	1			
	Endocervicitis and endometritis.....				2	2	2			
	Endometritis and dysmenorrhea.....				1	1		1		
	Extra uterine pregnancy.....				1	1				1
	Fissure in ano.....				2	1	3			
	Hyperemesis gravidarum.....				1	1		1		
	Peri-urethral abscess and stricture.....				1	1		1		
	Phlegmon of scrotum.....				1	1				1
	Stricture of rectum.....				4	4	2	1		
	Stricture of urethra.....				3	1	4	2		
	Ulcer of rectum.....				1	1	1			
Dilation and curettage.	Chronic endometritis.....				2	2	1	1		
Enucleation, eye.	Corneal ulcer.....				1	1		2		
	Diabetic cataract.....				2	2				
	Iridocyclitis, secondary glaucoma.....				1	1		1		
	Phthisis bulbi.....				1	1	1			
Examination.	Chancroidal phimosis.....				1	1		1		
	Cystitis.....				2	4	3	1		
	Fistula in ano.....				1	1			1	
	Gonorrheal arthritis.....				1	1		1		

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Exploratory excision.....	Tuberculous arthritis.....			1		1		1		
	Umbilical hernia.....				1	1	1			
	Adeno-cystoma.....				1	1	1			
	Axillary adenitis.....				1	1		1		
	Adenoma of breast.....				2	2	1	1		
	Bartholinian abscess.....				2	2	2			
	Bartholinian cyst.....			1		1		1		
	Contractions of old burn.....				1	1		1		
	Corns.....			1		1		1		
	Corpus luteum cyst.....				1	1	1			
	Cyst (invitation).....				1	1		1		1
	Elephantiasis of vulva.....				1	1		1		
	Fistula in ano.....	3		11		14	6	8		
	Foreign body (splinter).....	1				1	1			
	Hemorrhoids.....					2	1	1		
	Hydrocele.....	5		1		6	3	3		
	Hypertrophied labia majores.....				1	1		1		
	Inguinal adenitis.....	1		1		2		2		
	Lipoma.....	1		6		7	7			
	Lymph adenitis (suppurative).....				1	1	1			
	Phlebitis.....		1			1		1		
	Prepatella bursitis.....		1			1	1			
	Rectal abscess.....				1	1		1		
	Rectal ulcer.....				1	1	1			
	Rectal polypus.....			1		1		1		
	Retropertoneal glands.....					1		1		
	Salpingitis (ruptured).....				1	1		1		
	Sarcoma.....	1		1		2	1	1		
	Toenail (ingrowing).....				1	1		1		
	Ulcers.....	1		1		2	1	1		
	Uterine polypus.....				1	1	1			
Extraction:										
Eye.....	Senile cataract.....			3	1	4		4		
Leg.....	Bullet.....			2		2	1	1		
Forceps delivery.....	Dystocia.....				5	5	5			
	Echampsia.....				1	1	1			
	Face presentation.....				1	1	1			
	Placenta previa.....				1	1	1			
Freeing adhesions.....	Adherent prepuce of clitoris.....				1	1		1		
	Adhesive peritonitis.....				1	1		1		
	Intestinal obstruction.....			2	2	4	2	1		
	Pelvic adhesions.....				1	1	1			1
	Pericholecystitis.....				1	1	1			
	Post operative adhesions.....			2	4	6	4	2		
	Pyosalpingitis with adhesions.....				1	1		1		
	Salpingitis.....				1	1	1			
	Tenosynovitis.....				1	1		1		
Hemorrhoidectomy.....	Hemorrhoids:									
	External.....			6	7	13	9	3		1
	Internal.....			6	2	8	7	1		
	Mixed.....			8	2	10	9	1		
Hernioplasty.....	Epigastric hernia.....					1	1			
	Femoral hernia.....			1		1	1			
	Inguinal hernia:									
	Direct.....			27		27	25	1		1
	Indirect.....			25	7	32	27	1		4
	Umbilical hernia.....			3	4	7	6	1		
	Ventral hernia.....				3	3	2			1
Incision and curettage.....	Abscess of thigh.....				1	1	1			
	Cellulitis of finger.....			1		1		1		
	Fistula in ano.....				1	1	1			
	Infected wound of thigh.....			1		1		1		
	Osteomyelitis.....			1	1	2	2			
	Periostitis.....			1		1	1			
	Peritonitis (tuberculous).....			1		1	1			
	Ranula.....			1		1	1			
Incision and drainage:										
Abscess.....	Alveolar abscess.....				2	2	1	1		
	Axillary.....				1	1		1		
	Appendiceal abscess.....			1		1	1			
	Arthritis, suppurative.....			1		1	1			
	Fascia lata.....			1		1		1		
	Fascial.....				1	1		1		
	Palmer.....				1	1		1		
	Parotid fascia.....				1	1	1			

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Incision and drainage—Con.										
Abscess—Continued.....	Pelvic abscess.....				2	2	1	1		
	Perineal abscess.....			1		1	1			
	Perirectal.....			1	1	2	1	1		
	Mammary.....				2	2	1	1		
	Pyæmia.....			1		1				
	Ischio-rectal abscess.....				1	1	3			
	Scrotal.....			2		2	1		1	
	Submaxillary.....			1		1		1		
	Temporal fascia.....			1		1	1			
	Thigh.....			2		2		2		
	Vulva.....				1	1	1			
Adenitis.....	Cervical.....			4		4	1			
	Epitrochlear.....				1	1				
	Inguinal.....			8		8		8		
Cellulitis.....	Neck.....			2		2	2			
	Thigh.....			1		1				
Gangrene.....	Hand.....			1		1				1
Infections.....	Bullet wounds.....			2		2	1	1		
	Hand and forearm.....			1		1				1
	Fistula in ano.....			5		5	3	1		1
	Inflammatory thyroiditis.....			1		1	1			
	Lymphadenitis.....			1		1	1			
	Phlegmon of penis.....			1		1		1		
	Phlegmon of scrotum.....			4		4	1	1		2
	Peritonitis.....				1	1				1
	Peritonitis (tuberculous).....				1	1		1		
	Mastitis.....				1	1		1		
General conditions.....	Cyst:									
	Dental roots.....				1	1		1		
	Retroperitoneal.....			2		2				2
	Generalized carcinoma-tosis.....				3	3		2	1	
	Osteal, spurs.....				1	1	1			
	Hematoma.....			1		1		1		
	Stricture (rectal).....				1	1	1			
Iridectomy.....	Glaucoma.....			1		1	2	1		
Lateral incisions.....	Chancroids.....			2		2	1	1		
	Chancroidal phimosis.....			11		11	8	3		
	Elongated prepuce.....			2		2	2			
	Phimosis.....			1		1		1		
	Para phimosis.....			1		1	1			
Lumbar puncture.....	Paraplegia.....			3		3	1	1	1	
Manipulation.....	Ankylosis, elbow joint.....			1		1		1		
	Fracture of radius (ankylosis).....				1	1	1			
	Gonorrheal arthritis.....				1	1		1		
	Prostatitis, acute.....				1	1		1		
	Subcoracoid dislocation.....				1	1		1		
Needling.....	Cataract.....			1		1	2	1		
Nephrectomy.....	Pyo nephrosis.....			1		1	2	1		
Paracentesis.....	Ascites.....			1	3	4	2	1	1	
Perineal section.....	Urethral stricture.....			2		2	1	1		
Perineorrhaphy.....	Lacerated perineum.....				13	13	8	5		
	Procidencia uteri.....				2	2	2			
	Rectocele.....			1		1		1		
	Rectocele and cystocele.....			1		1	1			
Plaster cast.....	Deformity.....			1		1		1		
	Dislocation.....			4	2	6	2	4		
	Fractures.....			5	6	11		10		1
	Osteo arthritis.....				1	1		1		
	Tuberculosis:									
	Astragalus.....			1		1		1		
	Hip.....			1		1		1		
Podalic version.....	Placenta previa.....				1	1	1			
	Transverse presentations.....				1	1	1			
Posterior colpotomy.....	Pelvic abscess.....				1	1				
Prostatectomy, supra-pubic.....				10		10	6	2		2
Radical amputation.....	Carcinoma.....				11	11	1	10		
	Cysto carcinoma.....				1	1		1		
Reduction.....	Dislocation:									
	Elbow.....			1		1	1			
	Shoulder.....			2		2	2			
	Hip.....				1	1	1			
	Knee.....			1		1	1			
	Fracture.....			1		1		1		
	Phimosis (para).....			3		3	3			

Operations and results, all patients—Continued.

Operation.	Diagnosis.	White.		Colored.		Total.	Recovered.	Improved.	Unimproved.	Died.
		Male.	Female.	Male.	Female.					
Reduction and fixation.....	Dislocation.....				1	1	1			
	Fracture:									
	Femur.....			2	2	4	1	3		
	Fibula.....			1	1	2		2		
	Humerus.....			1	1	2	1	1		
	Mandible.....			2		2	1	1		
	Tibia.....			3		3	1	2		
	Tibia and fibula.....			4	1	5	1	4		
	Ulna.....			1		1		1		
Removal:										
Bead.....	Ear, in.....				1	1	1			
Bone.....	Fractured bone.....			4		4	2	2		
Bullet.....	Shoulder.....			1		1	1			
Glass.....	Foot.....			1		1	1			
Splinter.....	Hand.....			1		1	1			
Cartilage.....	Semilunar.....			1		1	1			
Cyst.....	Dermoid.....				1	1	1			
	Ovarian.....				1	1	1			
	Sebaceous.....			1		1		1		
Tumor.....	Fibroma.....			1		1		1		
	Lipoma.....			1		1		1		
Lymphatics.....	Submaxillary infection.....			1		1	1			
Sutures.....	Enucleation.....			1		1		1		
Repair.....	Aneurism.....			1		1		1		
	Cataract (post operative).....				2	2		2		
	Harelip.....				1	1	1			
	Hydrocele.....			1		1	1			
	Laceration:									
	Eyelids.....			1		1	1			
	Scalp.....				1	1		1		
	Splinter and.....			1		1		1		
Resection.....	Perforation, intestinal.....			1	1	2	1			1
	Arthritis of knee (tuberculous).....			1		1				1
	Hallux valgus.....				1	1	1			
	Intestinal obstruction.....				4	4	1			
	Tuberculous knee.....				1	1				1
	Ulcer, varicose of saphenous vein.....				1	1		1		
Sequestrotomy.....	Osteomyelitis of femur.....			1		1	1			
Suturing.....	Lacerated:									
	Eye.....			1		1	1			
	Scalp.....			4	2	6	6			
	Leg.....			1		1	1			
Skin grafting.....	Burn of thorax, laterally.....			2		2		2		
	Post operative scars.....				1	1	1			
	Varicose ulcer of leg.....				1	1		1		
Surgical dressings.....	Wounds.....			3	3	6	6			
Tenotomy.....	Talipes equino-varus.....			1		1		1		
	Tendo achilles, rupture of.....			1		1	1			
Thyroidectomy.....	Cystic goiter.....				2	2	2			
	Exophthalmic goiter.....				1	1	1			
	Nodular goiter.....				2	2	1	1		
	Parenchymatous goiter.....				3	3	3			
Tonsillectomy.....	Hypertrophied tonsils.....			1	95	96	164	29		1
Tracheorrhaphy.....	Hypertrophied cervix.....				1	1	1			
	Lacerated cervix.....				7	7	5	2		
Vesicle irrigation.....	Cystitis.....				1	1	1			
Whiteheads.....	Internal hemorrhoids.....			1		1	1			
Wiring of bone fracture.....	Clavicle.....			1		1	1			
	Femur.....			1		1	1			
Total.....		1	1	737	1,277	2,016	1,472	434	30	79

Obstetrical record, except pay patients.

Month.	Colored.			Caesarian section.	Podalic version.	Lacerations.	Post-partum hemorrhage.	Stillbirths.	Twins.	Head.	Breech.	Face.	Foretop.	Primipara.	Multipara.
	Male.	Female.	Total.												
July.....	14	10	24	.....	.....	11	1	4	1	20	.....	.....	.....	13	10
August.....	11	16	27	.....	.....	10	3	5	.....	20	1	.....	.....	16	11
September.....	11	17	28	1	.....	7	.....	2	.....	24	2	.....	.....	14	14
October.....	14	10	24	.....	.....	11	.....	2	.....	22	.....	.....	1	16	8
November.....	13	8	21	.....	.....	9	1	4	.....	16	1	.....	.....	13	8
December.....	16	13	29	.....	.....	10	2	2	.....	27	.....	.....	.....	14	15
January.....	15	10	25	.....	.....	11	3	2	.....	22	1	.....	.....	14	11
February.....	17	8	25	.....	.....	12	1	6	.....	17	2	.....	1	13	12
March.....	12	15	27	1	.....	10	6	6	1	19	2	.....	.....	18	8
April.....	7	8	15	1	.....	4	1	3	.....	11	.....	.....	.....	9	6
May.....	14	11	25	.....	.....	9	1	4	.....	20	.....	1	1	16	9
June.....	8	9	17	.....	1	4	.....	2	.....	14	1	.....	.....	9	8
Total.....	152	135	287	3	1	108	19	42	2	232	10	1	3	165	120

Anesthetics, all patients.

	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
General:					
Chloroform.....			5	7	12
Chloroform and ether.....				3	3
Chloroform and cocaine.....			4	2	6
Ether.....		1	631	1,223	1,855
Ether and olive oil.....				1	1
Nitrous oxide and ether.....			10		10
Nitrous oxide and chloroform.....				1	1
Novocaine and ether.....			3	2	5
Local:					
Apothecene.....			20	5	25
Cocaine.....			35	4	39
Cocaine and apothecene.....			15	6	21
Ethyl chloride.....			6	6	12
Novocaine.....			5	9	14
Novocaine and apothecene.....			3	7	10
Total.....		1	737	1,277	2,014

Pathological and X-ray laboratories.

RADIOGRAPHS.

	1920	1919		1920	1919
Abdomens.....	80	54	Humeri.....	16	12
Chests.....	152	116	Kidneys and ureters.....	31	29
Elbows.....	21	18	Knees.....	67	32
Feet and ankles.....	72	48	Shoulders.....	36	22
Femurs.....	50	54	Spine.....	22	12
Forearms.....	41	32	Tibias.....	44	14
Heads and teeth.....	92	82	Hands and wrists.....	82	78
Hips and pelvis.....	47	19	Total.....	853	622

Pathological and X-ray laboratories—Continued.

X-RAY TREATMENTS.

Disease.	Cases.	Cured.	Im- proved.	Un- known.	Treat- ments.
Post operative carcinoma (breast).....	3	.....	3	.....	18
Goitre.....	1	.....	1	.....	8
Tuberculous adenitis.....	9	7	1	1	62
Keloids.....	12	8	2	2	74
Total.....	25	15	7	3	162

LABORATORY EXAMINATIONS.

	1920	1919		1920	1919
Red counts.....	121	74	Autopsies.....	6	12
White counts.....	416	330	Museum specimen.....	62	35
Hemoglobin estimate.....	133	60	Sputum examinations.....	305	104
Widal reactions.....	54	55	Urinalyses.....	2,127	1,422
Malarial examinations.....	3	1	Noguchi reactions.....	1,346	1,107

Total number positives, 399, or 29.6 per cent.

Total number negatives, 957, or 70.4 per cent.

Three hundred and thirty-seven of these cases (about 25 per cent) came from the dispensary, of which 27 per cent were positive.

Numerous examinations of gastric contents, feces, bacteriological smears and cultures, differential counts, blood cultures, coagulation estimates, spinal fluids, "red tests," and blood sugars were made and are not enumerated above.

Nativities, except pay patients.

Nativities.	White.		Colored.		Nativities.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Africa.....	.....	.....	2	.....	Michigan.....	.....	.....	.....	1
Alabama.....	.....	.....	11	5	Mississippi.....	.....	.....	5	7
Arkansas.....	.....	.....	1	.....	Missouri.....	.....	.....	2	4
British West Indies.....	.....	.....	7	2	Montana.....	.....	.....	.....	1
California.....	.....	.....	1	.....	Nebraska.....	.....	.....	.....	2
Canada.....	.....	.....	3	.....	New Jersey.....	.....	.....	6	7
Connecticut.....	.....	.....	3	4	New York.....	1	.....	3	9
Colorado.....	.....	.....	1	.....	North Carolina.....	1	.....	39	88
District of Columbia.....	4	1	413	536	Ohio.....	.....	.....	3	5
Delaware.....	.....	.....	2	.....	Oklahoma.....	.....	.....	1	4
Florida.....	.....	.....	7	4	Pennsylvania.....	.....	.....	15	43
Georgia.....	.....	.....	12	19	Porto Rico.....	.....	.....	1	.....
Greece.....	1	.....	.....	.....	Rhode Island.....	.....	.....	1	2
Honolulu.....	.....	.....	1	.....	South Carolina.....	.....	.....	25	85
Illinois.....	.....	.....	2	2	Tennessee.....	.....	.....	8	5
Italy.....	1	.....	.....	.....	Texas.....	.....	.....	7	5
Indiana.....	.....	.....	1	2	Virginia.....	1	.....	371	439
Kansas.....	.....	.....	2	4	West Virginia.....	.....	.....	8	7
Kentucky.....	1	.....	5	5	Unknown.....	.....	.....	2	1
Louisiana.....	.....	.....	4	1					
Massachusetts.....	1	.....	1	5	Total.....	11	1	1,190	1,543
Maryland.....	.....	.....	224	240					

Occupations, except pay patients.

Occupations.	White.		Colored.		Occupations.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Actress.....				6	Laborer.....	4		463	
Baker.....	1				Laundress.....				41
Barber.....			7		Mechanic.....			8	
Bellman.....			6		Maid.....				24
Blacksmith.....			3		Matron.....				1
Business.....	1		2		Messenger.....			12	
Butler.....			1		Merchant.....			1	
Carpenter.....	1		4		Miner.....			5	
Charwoman.....				2	Minister.....				7
Chauffeur.....			41		Nurse.....				
Clerk.....			3	1	Orderly.....			5	
Cook.....			13	30	Porter.....			24	
Dentist.....			2		Salesman.....	1			
Doctor.....			2		Shoemaker.....	1			
Domestic.....				1,017	Skilled laborer.....			2	
Dressmaker.....				15	Soldier.....			4	
Driver.....			19		Student.....	1		279	115
Elevator operator.....			3	3	Tailor.....			19	
Farmer.....			52		Waiter.....			25	
Fireman.....			8		Watchman.....			2	
Government employee.....			11	3	None (including births in hospital).....	1		152	138
Hairdresser.....				1					
Housewife.....				139					
Janitor.....			17		Total.....	11		1,199	1,543

Nativities, pay patients, except births.

Nativities.	White.		Colored.		Nativities.	White.		Female.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Alabama.....			1		Nebraska.....			1	
Arkansas.....			2	4	New Jersey.....			2	4
Central America.....			1		New York.....			4	2
District of Columbia.....			124	175	North Carolina.....			14	31
Florida.....			2	3	Ohio.....			1	
Georgia.....			4	15	Pennsylvania.....			2	5
Illinois.....	1				South Carolina.....			10	20
Indiana.....			1	2	Tennessee.....			4	1
Kansas.....				1	Texas.....			1	2
Kentucky.....			2	4	Virginia.....			66	167
Louisiana.....			3	2	West Virginia.....			2	3
Maryland.....	1		26	65	Wisconsin.....			1	
Maine.....			1		Unknown.....	2			
Mississippi.....			4	5					
Missouri.....			2	1	Total.....	2	2	294	512

Occupations, pay patients, except births.

Occupations.	White.		Colored.		Occupations.	White.		Colored.	
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.
Agent.....			1		Laundress.....				2
Barber.....			4		Janitor.....			1	
Butler.....			1		Maid.....				2
Carpenter.....			3		Mechanic.....	2		2	
Chauffeur.....			4		Messenger.....			20	
Clerk.....			7	3	Minister.....			1	
Cook.....			5	4	Nurse.....				4
Dentist.....			1		Porter.....			7	
Doctor.....			3		Sailor.....	1			
Domestic.....				338	Skilled laborer.....			15	
Dressmaker.....				15	Student.....			64	65
Driver.....			1		Tailor.....			2	
Farmer.....			18		Teacher.....			4	8
Grocer.....					Waiter.....			12	
Government employee.....	1		19	12	None.....		1		
Housewife.....		1		54					
Laborer.....			89		Total.....	2	2	294	512

OUTDOOR SERVICE.

The following tables show the number of medical and surgical diseases treated in the outdoor or dispensary service:

Medical and surgical diseases—Out-patient department.

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
<i>Medical.</i>					
Adenitis, cervical			4	3	7
Anemia, secondary			4	8	12
Aneurysm, aortic			2	1	3
Amenorrhoea				3	3
Appendicitis, chronic			9	11	20
Arthritis, infectious			4	2	6
Arterio sclerosis	3	1	22	7	33
Angina pectoris	1	1	1		2
Auto intoxication			7	4	11
Bronchitis:					
Acute		3	47	20	70
Chronic			22	12	34
Bronchial asthma	2		9	5	16
Cardiac hypertrophy			11	3	14
Chlorosis				1	1
Coryza, acute			4	9	13
Cystitis, acute			9	3	12
Diabetis mellitus				7	7
Empyema			2	1	3
Endocarditis			1	4	5
Enteritis			10	3	13
Epilepsy			3	1	4
Gastritis:					
Acute			22	18	40
Chronic			9	17	26
Gastroenteritis			5	9	14
Gout, exophthalmic				2	2
Hemorrhoids			4	6	10
Hepatitis			2	1	3
Hypertension			12	6	18
Influenza	12	7	53	37	109
Intestinal indigestion			1	3	4
Malaria			1	1	2
Migraine			2	7	9
Mitral insufficiency	2	1	15	22	40
Mitral stenosis	1			4	5
Menopause				7	7
Mucus colitis			3	5	8
Myalgia			2	9	11
Myocarditis			1	9	10
Neuralgia:					
Facial			2	9	11
Intercostal			4	10	14
Nephritis:					
Acute			12	9	21
Chronic			18	10	28
Neurasthenia	1		1	9	11
Parotitis			2		2
Pleurisy:					
Acute plastic			9	3	12
With effusion			2	1	3
Pneumonia:					
Bronchial			17	3	20
Lobar			4	3	7
Pregnancy				3	3
Paralysis agitans				1	1
Polymeuritis	1		2	1	4
Rheumatism:					
Acute			12	8	20
Gonorrheal			7		7
Muscular			8	4	12
Rubella			5	4	9
Scleritis		1		3	4
Syphilis	2		4	3	9
Toxillitis			4	7	11
Variella			3	4	7
Urticaria			5	8	13
Undiagnosed			21	15	36
Total	25	14	453	389	881
Revisits					1,422

Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.	
<i>Minor surgery.</i>					
Abscess:					
Alveolar			5	3	8
Cervical			4	3	7
Peritonsillar			3	8	11
Adenitis:					
Axillary			2	4	6
Cervical			3	5	8
Inguinal			2	1	3
Angioma	1			1	2
Cellulitis:					
Arm	2	1	5	3	11
Hand	1	3	10	22	30
Leg			9	11	20
Chondromata			2		2
Cyst, sebaceous			1	7	8
Dislocations:					
Elbow			3	1	4
Shoulder	1		5	2	8
Thumb			4	2	6
Fractures:					
Colle's			8	3	11
Humerus			2	2	4
Mandible			1	2	3
Metarsus			5	1	6</

Medical and surgical diseases—Out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.	Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.			Male.	Female.	Male.	Female.	
Dermatology—Contd.						Genito-urinary—Contd.					
Prytiasis rosea.....			1	3	4	Syphilis:					
Scabies.....	2		9	5	16	Primary.....	3		21		24
Seborrhea.....			6	11	17	Secondary.....	2		15		17
Sycosis, nonparasitic.....			4		4	Tertiary.....			4		4
Syphilis, secondary.....			11	5	16	Stricture, urethral.....			10		10
Tinea tonsurans.....			25	10	35	Urethritis:					
Urticaria.....			9	11	20	Anterior.....			115		115
Undiagnosed.....			7	9	16	Posterior.....			52		52
Total.....	4		151	140	294	Varicocele.....	2		9		11
Revisits.....					390	Total.....	13		395		408
Pulmonary tuberculosis.						Revisits.....					1,190
Pulmonary tuberculosis.....			12	7	19	Gynecology.					
Revisits.....					15	Abscess:					
Ear, nose, and throat.						Pelvic.....			7		7
Abscess:						Vulvo-vaginal.....			12		12
External meatus.....		1	2	5	8	Adenitis:					
Peritonsillar.....			6	22	30	Femoral.....			11		11
Adenoids.....			23	47	70	Inguinal.....			23		23
Cerumen, impaction of.....			18	5	23	Adhesions, post operative.....			9		9
Epi-staxis.....			3	9	12	Amenorrhea.....			3		3
Foreign body:						Carcinoma:					
Ear.....				5	5	Cervix.....			3		3
Throat.....			3	15	18	Uterus.....			5		5
Faucitis, acute.....			5	2	7	Caruncle, urethral.....			3		3
Gumma of palate.....			3		3	Cervicitis.....			15		15
Laryngitis:						Chancroid.....			5		5
Acute.....			29	37	66	Condylomata.....			31		31
Chronic.....			9	11	20	Cysts, ovarian.....			5		5
Specific.....			8	1	9	Cystitis.....			31		31
Lingual varix.....			4	1	5	Dyscoele.....			9		9
Nasopharyngitis.....			7	18	25	Dysmenorrhea.....			37		37
Nasal septum, ulceration of.....			3	2	5	Endocervicitis.....			19		19
Otitis externa.....			5	1	6	Endometritis.....			22		22
Otitis media:						Fibroma uteri.....			33		33
Acute.....			7	10	17	Gonorrhea, acute.....			12		12
Chronic.....			2	9	11	Hernia:					
Pharyngitis:						Femoral.....			5		5
Acute.....			25	37	62	Inguinal.....			3		3
Chronic.....			33	19	52	Umbilical.....			9		9
Specific.....	2		8	1	11	Lacerations:					
Rhinitis:						Cervix.....			21		21
Acute.....	3		17	10	30	Perineum.....			33		33
Hypertrophic.....			7	1	8	Lues.....			18		18
Tonsillitis:						Mastitis.....			7		7
Acute.....			1	25	26	Menopause.....			39		39
Follicular.....			16	22	38	Menorrhagia.....			7		7
Tonsils, hypertrophy of:						Ovaritis.....			33		33
Faucial.....	3	5	76	97	181	Pregnancy.....			85		85
Lingual.....			7	3	10	Salpingitis:					
Turbinate bones, hypertrophy of.....			13	8	21	Acute.....			53		53
Undiagnosed.....			15	22	37	Chronic.....			31		31
Total.....	8	7	381	457	838	Pyosalpinx.....			18		18
Revisits.....					1,320	Uterine displacements:					
Genito-urinary.						Antiversion.....			22		22
Abscess, perithurethral.....	1		3		4	Prolapse.....			14		14
Adenitis:						Retroversion.....			44		44
Femoral.....			11		11	Uterine subinvolution.....			15		15
Inguinal.....			51		51	Vaginitis.....			18		18
Chancre.....	3		21		24	Vulvitis.....			13		13
Condylomata.....			6		6	Undiagnosed.....			28		28
Epididymitis.....			10		10	Total.....			814		814
Hydrocele.....	2		5		7	Revisits.....					1,345
Paraphimosis.....			5		5	Eye.					
Phimosis.....			42		42	Amblyopia.....			4	3	7
Prostate gland, hypertrophy of.....			7		7	Angio-scleritis.....			1	4	5
Prostatitis.....			8		8	Aphakia.....			3		3
						Arterioscleritis.....			12	5	17
						Atrophy, optic.....			7	3	10
						Astigmatism:					
						Hyperopic.....			27	51	78
						Myopic.....			15	33	48

Medical and surgical diseases—Out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.	Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.			Male.	Female.	Male.	Female.	
<i>Eye—Continued.</i>						<i>Orthopedic.</i>					
Blepharitis, marginatis.....			8	12	20	Ankylosis:					
Burn of eye.....			4	2	6	Elbow.....			3	1	4
Cataract.....			16	27	43	Hip.....				2	2
Chalazion.....	3	1	22	18	44	Knee.....	1		4	3	8
Circumcorneal hypertro-						Arthritis:					
phy.....			3	1	4	Gonorrheal.....			5		5
Choked disk.....			11	3	14	Hypertrophic.....			2	3	5
Choroido-retinitis.....			22	12	34	Infectious.....			7	9	16
Choroido-iritis.....			7	3	10	Bursitis, subacromial.....			7	4	11
Conjunctivitis:						Contractures:					
Catarrhal.....		2	7	17	26	Ankle.....			2	1	3
Follicular.....			3	5	8	Knee.....			5	4	9
Phlyctenular.....			18	20	38	Fractures:					
Gonorrheal.....			4	3	7	Astragalus.....			2		2
Purulent.....			3	1	4	Tibia.....			4	1	5
Traumatic.....			15	5	20	Dislocation, semilunar					
Corneal ulcer.....			21	12	33	cartilage.....			3	2	5
Dacryocystitis.....			8	12	20	Genu valgum.....			4	3	7
Echymosis, subconjunctival.....			14	8	22	Genu varum.....			2	4	6
Episcleritis.....			2	7	9	Osteomyelitis.....			4	2	6
Foreign body in eye.....	4	2	12	18	36	Paralysis:			2		2
Glaucoma.....			4	7	11	Periostitis:					
Hordeolum.....	1		13	9	23	Specific.....					
Iritis.....			31	18	49	Traumatic.....			11	3	14
Iridocyclitis.....			2	5	7	Pesplanus.....			7	3	10
Keratitis.....			4	4	8	Sacro-iliac relaxation.....			3	1	4
Kerato-iritis.....			3	2	5	Scoliosis.....			2	1	3
Keratitis, phlyctenular.....			1	1	2	Sprains:					
Mopla.....			10	21	31	Ankle.....			7	2	9
Paralysis:						Wrist.....			5	1	6
Sixth nerve.....			2	1	3	Synovitis.....			3	2	5
Third nerve.....				1	1	Tuberculous:					
Phthisis bulbi.....			3	1	4	Hip.....			3	2	5
Phlyctenular ophthalmi-						Knee.....			2	5	7
tis.....			8	4	12	Undiagnosed.....			2	4	6
Presbyopia.....			2	5	7						
Pterygium.....			10	8	18	Total.....	1		110	65	176
Refractions.....			97	204	301	Revisits.....					390
Retinitis.....			20	31	51						
Retinitis, neuro.....			8	3	11	<i>Pediatrics.</i>					
Strabismus:						Acne vulgaris.....			4	9	13
External.....			4	9	13	Astigmatism.....			3	2	5
Internal.....			2	5	7	Adenoids.....			9	4	13
Subconjunctival hemor-						Edenitis, tuberculous.....			1	3	4
rhage.....			11	4	15	Bronchitis:					
Undiagnosed.....			28	21	49	Acute.....			11	20	31
Total.....	8	5	632	1,024	1,669	Chronic.....			3	7	10
Revisits.....					2,920	Chorea.....				3	3
<i>Neurology.</i>						Colitis.....			2	5	7
Ascending paralysis.....			5	1	6	Constipation.....			1	3	4
Bell's paralysis.....				5	5	Contusions.....			2		2
Chorea.....			7	7	14	Dermatitis.....			5	3	8
Embolism, cerebral.....			9	3	12	Diarrhea.....			8	11	19
Epilepsy.....			10	6	16	Eczema.....			4	7	11
Hemorrhage, cerebral.....			3	2	5	Enteritis.....			3	7	10
Hypert thyroidism, latent.....				2	2	Enterocolitis.....			4	2	6
Hypo-endocrania.....				1	1	Hernia:					
Hypopituitarism.....				2	2	Inguinal.....			2	1	3
Hysteria.....				7	7	Umbilical.....			5	2	7
Neurasthenia.....			2	7	9	Gastritis, acute.....			5	12	17
Neuroses, occupational.....			5	1	6	Impetigo.....			2	1	3
Neuritis.....			4	7	11	Intestinal worms.....			4	8	12
Paraplegia, spastic.....			3		3	Laryngitis, acute.....			3	3	6
Sclerosis, central fissure.....			1		1	Lues, congenital.....			2	4	6
Syphilis:						Malnutrition.....			1	3	4
Cerebral.....			3	1	4	Marasmus:					
Spinal.....				2	2	Luetic.....			1	1	2
Tabes dorsalis.....			5		5	Tuberculous.....			2	1	3
Undiagnosed.....			7	10	17	Ophthalmia neonatorum.....			2	1	3
Total.....			59	62	121	Otitis media.....			4	7	11
Revisits.....						Ozena.....			1		1
						Pharyngitis.....			5	2	7
						Phimosis.....			12		12
						Pertussis.....			4	3	7

Medical and surgical diseases—Out-patient department—Continued.

Diagnosis.	White.		Colored.		Total.	Diagnosis.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.			Male.	Female.	Male.	Female.	
<i>Pediatrics—Continued.</i>						<i>Pediatrics—Continued.</i>					
Pneumonia:						Tonsillitis.....			11	18	29
Lobar.....			1	2	3	Tracheitis.....			2	5	7
Bronchial.....			5	9	14	Ulcer of leg.....			3	1	4
Rachitis.....			3	1	4	Vaginitis.....				5	5
Scabies.....			4	2	6	Undiagnosed.....			12	20	30
Stomatitis.....			3	7	10	Total.....			162	208	372
Tinea capitis.....			1	3	4	Revisits.....					455
Tinea circinata.....			2		2						

Statistical summary.

	1920					1919				
	White.		Colored.		Total.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.	
In hospital July 1, 1918.....								93	125	218
In hospital July 1, 1919:										
Pay patients.....			14	29	43					
Indigent—										
United States.....			33	43	76					
District of Columbia.....			30	43	73					
Total.....			77	115	192			93	125	218
Admitted:										
Pay patients.....	2	1	283	499	785	1	6	302	573	882
Pay patients, births.....			35	47	82			34	43	77
Indigent—										
United States.....	3	1	463	648	1,115	10	1	398	556	965
District of Columbia.....	7		691	781	1,479	5	4	701	949	1,659
Births—										
United States.....			50	52	102			64	52	116
District of Columbia.....			75	76	151			69	84	153
Total admitted.....	12	2	1,597	2,103	3,714	16	11	1,568	2,257	3,852
Total under care, indoor.....	12	2	1,674	2,218	3,906	16	11	1,661	2,382	4,070
Stillbirths:										
Pay patients.....								1	4	5
Indigent.....			24	18	42			9	15	24
Total.....			24	18	42			10	19	29
Deaths:										
Pay patients.....			16	33	49			23	41	64
Indigent.....	2		96	116	214			144	142	286
Total.....	2		112	149	263			167	182	350
Discharged, including births:										
Pay patients—										
Recovered.....					483					476
Improved.....					266					304
Unimproved.....					42					42
Not treated.....					42					66
Total.....					833					890
Indigent—										
Recovered.....					1,347					1,360
Improved.....					1,087					1,046
Unimproved.....					210					216
Not treated.....					5					16
Total.....					2,649					2,638
Grand total discharged.....					3,745					3,878

FREEDMEN'S HOSPITAL.

Statistical summary—Continued.

	1920					1919				
	White.		Colored.		Total.	White.		Colored.		Total.
	Male.	Female.	Male.	Female.		Male.	Female.	Male.	Female.	
In hospital July 1, 1920:										
Pay patients.....			21	6	27			14	29	43
Indigent—										
United States.....	2		27	27	56			33	43	76
District of Columbia.....			14	63	77			30	43	73
Total.....	2		41	90	133			63	86	149
Grand total remaining.....	2		62	96	160			77	115	192
Days maintenance:										
Pay patients.....					12,647					12,873
Indigent—										
United States.....					16,077					20,514
District of Columbia.....					42,216					39,888
Officers and employees.....					41,760					38,638
Total.....					112,700					111,913
Cost of patients per day.....					\$1.96					\$1.86
Largest number of indigent patients at any one time.....					195					218
Smallest number of indigent patients at any one time.....					120					134
Daily average number of patients, pay and indigent.....					194					169.7
Number admitted from District of Columbia, including births, indigent.....					1,630					1,810
Number admitted from United States, including births, indigent.....					1,217					1,049
Number prescriptions compounded:										
Indoor.....					29,096					26,540
Outdoor.....					5,533					4,368

FINANCIAL STATEMENTS.

BOARD OF CHARITIES ACCOUNT, JULY 1, 1919, TO JUNE 30, 1920.

	Adults.	Children.	Babies.	Total.
In hospital July 1, 1919.....	58	10	5	73
Admitted.....	1,318	161	151	1,630
Total.....	1,376	171	156	1,703

Appropriation.....	\$40,000
Bills rendered.....	40,000

ALLOTMENT OF APPROPRIATION FOR SALARIES.

[Under requirement of act of Congress approved June 25, 1909 (35 Stat., 992).]

Per annum.	Per annum.
Surgeon in chief.....	\$3,000
Assistant surgeon.....	1,200
Resident physician.....	1,200
Pathologist.....	2,000
Anesthetist.....	1,200
Clerk.....	1,400
Clerk, assistant.....	700
Clerk, assistant.....	636
Pharmacist.....	720
Pharmacist, assistant.....	120
Steward.....	720
Superintendent of nurses.....	1,080
Superintendent of nurses, assist- ant.....	600
Night supervisor of nurses.....	480
Head nurses (2 at \$480).....	960
Engineer.....	1,400
Engineer, assistant.....	1,100
Engineer, assistant.....	1,000
Plumber.....	960
Firemen (3 at \$720).....	2,160
Telephone operator.....	\$360
Seamstress.....	300
Nurses (48 at \$60).....	2,880
Orderly.....	300
Orderlies (4 at \$240).....	960
Orderly, night.....	340
Maids (3 at \$168).....	504
Head cook.....	840
Second cook.....	360
Third cook.....	288
Waiters (3 at \$180).....	540
Driver.....	408
Driver.....	360
Laundryman.....	420
Laundresses (5 at \$156).....	780
Laborer.....	240
Laborer.....	204
Laborer.....	240
Laborers (2 at \$200).....	400
Total.....	33,360

RECEIPTS AND DISBURSEMENTS.

Receipts:

Appropriation, sundry civil act—	
For support.....	\$47,000.00
Salaries.....	33,360.00
	80,360.00
Appropriations, third deficiency act.....	9,555.99
Appropriation, District of Columbia act (under contract with Board of Charities).....	40,000.00
Pay patients.....	21,664.50
Total.....	151,580.49

Disbursements:

Miscellaneous, fuel, light, clothing, forage, medicine, etc.....	38,906.03
Third deficiency.....	9,305.98
Pay patient.....	13,901.21
Subsistence.....	47,907.35
Pay patient.....	1,779.26
Salaries.....	33,234.14
Pay patient.....	4,885.27
Refunds, pay patients.....	994.90
Total disbursements.....	150,914.14

Unexpended balances:

Miscellaneous, fuel, light, clothing, forage, medicine, etc.....	93.97
Third deficiency.....	250.01
Pay patient.....	103.86
Subsistence.....	92.65
Salaries.....	125.86
Total unexpended balance.....	666.35

Miscellaneous expenditures.

Class No.		1920	1919	Class No.		1920	1919
1	Stationery and drafting supplies.....	\$283.56	\$598.49	11	Forage and seed.....	\$854.96	\$252.65
2	Hardware and metals:			12	Photographic supplies.....	407.22	151.61
	Hardware.....	124.67	256.21	14	Fuel:		
	Metals.....	72.58	159.88		Charcoal.....	34.20	70.15
3	Dry goods and wearing apparel, cordage.....	5,584.52	4,215.98		Coal, anthracite.....	220.98	25,811.63
4	Drugs and medicines:				Coal, bituminous.....	29,124.92	30.40
	Chemicals and reagents.....	5,377.41	.....		Wood.....	30.40	39.00
5	Laboratory, hospital appliances, surgical instruments, etc.:			15	Incandescent electric lamps.....	286.90	160.36
	Laboratory.....	92.84	70.52	20	Telephone service.....	621.22	434.06
	Hospital appliances.....	4,563.80	3,631.22		Heat, light, and power service:		
	Surgical.....	907.00	284.80		Gas.....	974.96	1,012.13
6	Electrical, engineering, and plumbing supplies.....	480.74	291.46		Gasoline.....	168.20	89.50
7	Lumber, millwork, and building material.....	180.21	40.02		Hauling ashes.....	696.85	774.36
8	Paints, oils, brushes, etc.:				Telegrams.....	8.81	7.47
	Brushes.....	33.48	67.28		Books and periodicals.....	10.00	30.80
	Oils, paints, and painters' supplies.....	457.33	493.98		Sundries (unclassified miscellaneous).....	190.27	305.42
9	Furniture.....	73.46	.....		Repairs:		
10	Household supplies:				Buildings.....	1,255.39	896.38
	Cleaning.....	376.02	196.28		Heating plant.....	2,826.81	1,775.27
	Laundry.....	1,752.30	1,493.83		Instruments.....	252.85	103.90
	Miscellaneous.....	2,568.52	1,207.51		Kitchen utensils.....	61.19	.....
					Laboratory.....	36.22	248.24
					Laundry.....	67.44	29.17
					Office.....	.....	.....
					Stable and ambulance.....	1,093.54	1,411.15
					Miscellaneous.....	271.51	106.00
					Total.....	62,113.22	49,549.91

Subsistence expenditures.

Class No.		1920	1919	Class No.		1920	1919
10	Beverages:			10	Fowl:		
	Cocoa.....	\$84.10	\$62.25		Chicken.....	\$4,127.71	\$3,480.50
	Coffee.....	855.53	330.87		Turkey.....	157.10	161.60
	Tea.....	313.98	372.00		Fruits.....	1,829.40	2,466.48
	Canned goods.....	2,329.84	2,428.01		Ice.....	1,076.50	905.60
	Condiments and flavors.....	225.87	164.51		Lard.....	322.70	417.99
	Cereal food products:				Masala oil.....	535.00	115.50
	Barley.....	6.83	9.50		Crisco.....	.....	.....
	Bread.....	3,520.54	4,112.54		Meats:		
	Corn flakes.....	107.75	218.00		Bacon.....	541.13	869.02
	Cornstarch.....	26.54	33.06		Shoulder.....	284.00	591.04
	Crackers.....	196.23	76.35		Beef.....	.....	.....
	Cream of wheat.....	47.47	45.20		Fresh.....	3,322.30	3,965.61
	Flour.....	340.06	372.00		Corned.....	260.53	451.91
	Gelatin.....	154.76	116.50		Chipped.....	245.30	348.50
	Hominy.....	13.75	15.90		Soup shank.....	171.92	275.53
	Macaroni.....	64.30	66.12		Ham, smoked.....	336.03	592.20
	Milk.....	22.68	47.71		Liver.....	117.83	355.37
	Oats, rolled.....	153.00	158.08		Mutton.....	1,438.78	3,034.65
	Rice.....	84.00	19.10		Lamb.....	.....	.....
	Spaghetti.....	48.00	42.24		Pork, fresh.....	819.58	463.04
	Taploca.....	134.27	542.50		Sausage, fresh.....	.....	148.41
	Unclassified.....	.....	.....		Sausage, smoked.....	418.56	252.41
	Dairy products:				Tongue.....	642.03	130.03
	Butter.....	5,660.53	4,537.08		Veal.....	368.25	708.56
	Buttermilk.....	117.04	93.26		Saccharine products:		
	Cheese.....	83.84	35.85		Sugar.....	.....	41.97
	Cream.....	79.00	66.38		Cut.....	1,719.15	1,513.08
	Milk, fresh.....	4,821.39	4,838.38		Granulated.....	.....	1.80
	Milk, condensed.....	2,729.74	2,627.70		Powdered.....	63.20	76.39
	Eggs.....	.....	511.01		Syrup.....	5,498.49	4,102.70
	Butterine.....	.....	.....		Vegetables.....	29.15	19.88
	Fish:				Chocolate.....	.....	.....
	Clam bouillon.....	8.46	24.00		Farina.....	33.24	.....
	Codfish.....	215.55	256.65		Molasses.....	6.90	.....
	Fresh.....	2,101.00	1,162.00		Soft drinks, ginger ale.....	19.80	.....
	Salt.....	314.73	51.54		Vermicelli.....	.....	.....
	Salmon.....	242.00	177.30		Total.....	49,686.61	49,153.36

Receipts and expenditures on account of pay patients.

	1920	1919
Receipts:		
Private-room patients, at \$2 per day.....	\$10,818.00	\$9,619.50
Private-room patients, at \$1.50 per day.....	559.00	301.25
Private-room patients, at \$1.25 per day.....		
Ward patients, at \$1.75 per day.....	7,049.00	4,837.50
Ward patients, at \$1.25 per day.....	791.25	220.00
Ward patients, at \$1.10 per day.....		
Children, at \$1 per day.....	384.00	592.50
Children, at 75 cents per day.....	18.75	13.65
Children, at 65 cents per day.....		
Babies, at 50 cents per day.....	427.50	322.40
Babies, at 40 cents per day.....	12.00	1,615.00
Operations.....	1,353.00	332.00
X-ray photos.....	168.00	25.00
Obstetrical cases.....	25.00	65.00
Examination of blood.....	65.00	
	21,064.50	17,878.40
Expenditures:		
Extra services (nurses, orderlies, maids).....	4,885.27	3,741.56
Subsistence.....	1,779.26	5,458.14
Medical and surgical supplies.....	3,107.95	826.03
Miscellaneous (dry goods, repairs, improvements).....	10,753.28	6,759.12
Refund of overpayment by patients.....	994.90	814.65
	21,560.64	17,630.10
Unexpended balance.....	103.86	278.04

NEEDS.

Attention has been called in previous annual reports to the need of several important additions to the hospital, which if supplied would make this institution a well-rounded hospital and would add greatly to its usefulness in the care of the sick. Although some are so important that it constitutes a very serious weakness of our establishment, it is thought best not to urge all anew at this time, owing to the high cost of building material and uncertain labor conditions. However, the building must be kept in a proper state of repair, and certain additions must be made and equipment replaced if the hospital is to continue to function anywhere near the standard already established. For this purpose \$4,000 should be provided for painting and repairs, \$2,990 for new surgical and medical equipment, \$16,500 for the replacement of the mechanical stoker in the boiler room, and \$65,000 for a pathological building. These items are so urgent and essential to the welfare of the hospital that further delay in providing the necessary appropriations is likely to lead to no little embarrassment to the institution.

TRAINING SCHOOL FOR NURSES.

The results of the work in this branch of the service were highly satisfactory.

The health of nurses in training was much better than during the previous year, although two resigned on account of ill health.

Instruction in dietetics at Howard University was continued as in former years. A course in public health lectures was given at the central registry by the District of Columbia League of Nursing Education.

The graduating exercises were held May 6, 1920, in the Andrew Rankin Memorial Chapel, 17 nurses graduating, making a total of 338 holding diplomas of the school.

Graduates of 1920.

Elsie A. Edwards, Harrisonburg, Va.	Inez E. Johnson, Charleston, S. C.
Lucille E. Williams, Kingston, Jamaica, British West Indies.	Minnie M. Stokes, Norfolk, Va.
S. Kathryn Thistle, Cheyenne, Wyo.	Myrtle A. Passon, Austin, Tex.
Ethel I. Watson, Philadelphia, Pa.	Agnes Alberta Roberts, Washington, D. C.
Marie S. Miles, Marshall, Va.	Annalice C. Green, Everett, Mass.
Nancy L. Dickerson, Philadelphia, Pa.	Ethyl F. Hazleton, Camden, N. J.
Carlotta Taylor, Boston, Mass.	Angeline A. Glosson, San Antonio, Tex.
Bessie Gibbs, Middleton, S. C.	Odeesa W. Dixon, Kansas City, Kans.
	Helen P. Skipwith, Philadelphia, Pa.

Applications, resignations, dismissals, etc.

Applications received during year..	60	Resigned.....	2
Applicants taken on probation.....	23	Dismissed.....	1
Accepted after probation.....	12	On probation.....	9
Not accepted after probation.....	2		

Lectures.

The course of lectures was delivered by the following staff:

Diseases of children.....	A. B. McKinney, M. D.
Gynecology.....	J. E. H. Taylor, M. D.
Anatomy and physiology.....	T. E. Jones, M. D.
Hygiene.....	C. A. Brooks, M. D.
Theoretical nursing.....	Laura R. MacHale.
Practical and theoretical nursing.....	Emma M. Irwin.
Diseases of the eye.....	Jas. C. Dowling, M. D.
Medical nursing.....	E. C. Terry, M. D.
Obstetrics.....	E. D. Williston, M. D.
Materia medica and therapeutics.....	John W. Mitchell, M. D.
Urinalysis and bacteriology.....	B. Price Hurst, M. D.
Neurology.....	Evelyn Mitchell, M. D.
Ear, nose, and throat.....	H. Martin, M. D.
Surgical nursing.....	Wm. A. Jack, M. D.
Dietetics.....	Mary Fitch.
Orthopedics.....	Wm. Erving, M. D.
Infectious diseases.....	P. M. Murray, M. D.

Nursing staff.

Superintendent of nurses.....	1
Assistant superintendent of nurses.....	1
Night supervisor of nurses.....	1
Head nurses.....	3
Seniors, members of class 1920, remaining.....	7
Seniors, class 1921.....	12
Intermediates, class 1922.....	18
Juniors, class 1923.....	1
Probationers.....	9

Course in cooking, theoretical and practical.

THEORY.

PRACTICAL WORK.

1. Water food.....	Coffee, tea, barley water, lemonade.
2. Carbohydrates—starch.....	Gruels, toast, Zwieback.
3. Carbohydrates—cellulose.....	Cereals and vegetables.
4. Carbohydrates—sugar.....	Fruits, sirups, jelly.
5. Fats and oils—salads.....	Salads, salad dressing, butter, cream.
6. Proteids—milk.....	Pasteurized, peptonized, koumiss.
7. Proteids—eggs.....	Cooked in shell, poached, omelets.
8. Proteids—milk and eggs.....	Custards, egg-nogs, egg lemonade.
9. Proteids—meat and fish.....	Broiling, roasting, meat sandwiches.
10. Proteids—meat.....	Beef juice, beef extract, broth.
11. Proteids—gelatin.....	Chicken jelly, veal jelly, beef jelly.
12. Review carbohydrates.....	Sponge cake, ice cream, water ices.

Three-year schedule.

Ward.	Day duty.	Night duty.
SURGICAL EXPERIENCE.		
Male.....	<i>Months.</i> 2	<i>Months.</i> 1
Female.....	2	1
Genito-urinary.....	1	1
Gynecological.....	4	2
Orthopedic.....	1	1
Emergency operating room.....	1	1
Main operating room.....	3	.....
Obstetrical.....	2	1
MEDICAL EXPERIENCE.		
Male.....	3	1
Female.....	3	1
Children.....	2	1
Diet kitchen.....	1	.....
Total.....	25	11

Occupation and residence of graduates.

1896.

Ashton, Luci V. (Mrs. Woods), Kansas City, Mo.
 Blackburn, N. L., private nurse, Philadelphia, Pa.
 Burke, Julia (Mrs. Phillips), Jacksonville, Fla.
 Fleetwood, Sara I., deceased.
 Foust, Isabella L., private nurse, Winston, N. C.
 Gibson, Katherine C., Bureau of Engraving and Printing, Washington, D. C.
 Green, Anna N., deceased.
 Owens, Laura A., private nurse, Washington, D. C.
 Pierce, Letitia (Mrs. Blair), Washington, D. C.
 Ricks, Antoinette M. (Mrs. Demby), Kansas City, Mo.
 Robinson, Annie B., superintendent and matron, Good Samaritan Hospital, Charlotte, N. C.
 Shorter, Sarah A., private nurse, Washington, D. C.
 Simms, Annie A. (Mrs. Johnson), Baltimore, Md.
 Smith, Gertrude (Mrs. Thorn), Washington, D. C.
 Tyler, Elizabeth, district nursing, New York City.

1897.

Caldwell, Amanda J. (Mrs. Darrell), Dallas, Tex.
 Combs, Annie, massage specialist, Washington, D. C.
 Green, Lucille (Mrs. Tibbe), St. Paul, Minn.
 Griffin, G. Josephine, private nurse, Washington, D. C.
 Haithcock, Ada, private nurse, Washington, D. C.
 King, Annie C. (Mrs. Hughes), Richmond, Va.
 Rollins, Willie M. (Mrs. Frazier), Washington, D. C.

Smith, S. May, private nurse, Troy N. Y.
 Thomas, Annie M., private nurse, Washington, D. C.
 Thompson, Della R. (Mrs. Davis), Vienna, Va.
 Underhill, Katherine P. (Mrs. Wm. Moten), Washington, D. C.
 Webb, Eva, private nurse, Washington, D. C.
 Warner, Florence A., private nurse, Springfield, Mass.
 Young, Lola E. M., private nurse, Greenville, S. C.

1898.

Bannister, Carrie J. (Mrs. Knox), Washington, D. C.
 Bennett, Florence R., private nurse, Baltimore, Md.
 Cabanua, Martha E., night supervisor, Freedmen's Hospital, Washington, D. C.
 Carter, Edith M., private nurse, New Rochelle, N. Y.
 Davis, Annie M., private nurse, Shelbyville, Tenn.
 Ennis, Sarah J. (Mrs. Brooks), Washington, D. C.
 Gaines, Mary R., private nurse, Berkeley, Calif.
 Geder, Isabella, private nurse, Binghamton, N. Y.
 Hurlong, Mary A., private nurse, Asheville, N. C.
 King, Carrie M. (Mrs. Foreman), Washington, D. C.
 Robinson, Amelia A., private nurse, Nashville, Tenn.
 Russell, Ruby E., private nurse, Charlottesville, Va.
 Stanton, Priscella (Mrs. Todd), Pittsburgh, Pa.
 Sumby, Lillie May, private nurse, Washington, D. C.

Valentine, J. Ella, private nurse, Lebanon, Ind.
Whitson, Clara E. (Mrs. Howe), Washington, D. C.

1899.

Banks, Effie P. (Mrs. Sykes), Indianapolis, Ind.
Brown, Agnes M., private nurse, Meyersdale, Pa.
Coleman, Georgia A., private nurse, Washington, D. C.
Diamond, S. Matthew (Mrs. Dibble), St. Louis, Mo.
Francis, Bertha A., head nurse, Home Hospital, Birmingham, Ala.
Hairston, Lula C. (Mrs. Crews), Winston, N. C.
Hankins, Mintha C., private nurse, Washington, D. C.
Hendricks, Eliza R. (Mrs. Brown).
Henry, Lillian M., private nurse, Downingtown, Pa.
Hoge, Carrie M., private nurse, Washington, D. C.
Keemer, Jessie E. (Mrs. Robinson), Providence, R. I.
McEwen, Irene O. (Mrs. Green), Pensacola, Fla.
Rich, Anna, private nurse, Hartford, Conn.
Scott, Helen V. (Mrs. Cole), Swansboro, Ga.
Thompson, Isabella, private nurse, New Orleans, La.
Wilson, Emma C., private nurse, Montgomery, Ala.
Williams, Elmira E., deceased.

1900.

Clarke, Mary F., private nurse, Richmond, Va.
Hamilton, Priscilla, deceased.
Hawkins, Nannie E., private nurse, Charlotte, N. C.
Hunton, Mary A. (Mrs. Gordon), St. Louis, Mo.
Johnson, Hattie B. (Mrs. Cunningham), Owensboro, Ky.
Lewis, Eva P., private nurse, Manassas, Va.
Mickens, Marcella C., private nurse, Pittsburgh, Pa.
Middleton, Hagar H., private nurse, Charleston, S. C.
Moody, Annie L., private nurse, Washington, D. C.
Smith, Cora V., private nurse, Camden, N. J.
Winfield, Laura, private nurse, Ware, Mass.

1901.

Allen, Margaret A., public health nurse, Jacksonville, Fla.
Barks, Susan C., visiting nurse, Jacksonville, Fla.

Campbell, B. N., private nurse, Montgomery, Ala.
Dey, Mary L., private nurse, Philadelphia, Pa.
Hackley, Mamie E. (Mrs. Ash), Philadelphia, Pa.
Hanson, Carrie L., private nurse, Baltimore, Md.
Harrell, Catherine S. (Mrs. Butler), Texas.
Hunter, Bessie, private nurse, Washington, D. C.
Jackson, Eliza A., private nurse, Richmond, Va.
Jones, Mary J., private nurse, Washington, D. C.
Powell, Gussie D., private nurse, Richmond, Va.
Rhône, Charlotte S., private nurse, Newbern, S. C.
Robinson, Frances A., private nurse, Newbern, N. C.
Thomas, Bertha J., head nurse, Freedmen's Hospital, Washington, D. C.
Walcott, Louisa M., private nurse, Rockhill, S. C.
Whitley, Florence A., private nurse, Newbern, N. C.

1902.

Adams, Ella C., private nurse, Philadelphia, Pa.
Baker, Vera L., head nurse, State Hospital, Goldsboro, N. C.
Booth, Mary S., private nurse, Washington, D. C.
Eelisse, Augusta V., private nurse, Brooklyn, N. Y.
Dias, Frances C., private nurse, Philadelphia, Pa.
Johnson, Gertrude B., private nurse, Niagara Falls, N. Y.
Mason, Corinna (Mrs. Phillips), Springfield, Mass.
Nichols, Florence L. (Mrs. Avant), Charlotte, N. C.
Rogers, Amanda, private nurse, Indianapolis, Ind.
Roper, Maggie A., private nurse, Galveston, Tex.
Thompson, Rachel A. (Mrs. Thomas), deceased.

1903.

Balentine, J. L. (Mrs. Dial), Jacksonville, Fla.
Browne, E. M., head nurse, Douglass Hospital, Philadelphia, Pa.
Baltimore, Mary E., private nurse, Harrisburg, Pa.
Christie, Sarah E. (Mrs. Selah), Chester, Pa.
Coates, Maiella E., private nurse, Washington, D. C.
Hargrave, L. S., private nurse, Trenton, N. J.
Johnson, L. D., private nurse, Warrenton, N. C.

Johnson, Nellie V., private nurse, Abbeville, S. C.
 Latney, Carrie L. (Mrs. Bowie), Washington, D. C.
 Love, Ellen V., private nurse, Lumberton, N. C.
 Purcell, E. J., private nurse, Brunswick, Ga.
 Rollins, Clara A., private nurse, Washington, D. C.
 Rutherford, Anna L., private nurse, Kingston, N. C.
 Sharp, Carrie M. (Mrs. Morgan), Petersburg, Va.
 Yarbrough, S. V. S. (Mrs. Allen), Columbus, Ga.

1904.

Baker, Hattie E., private nurse, Darlington, S. C.
 Blackwell, W. Lucille (Mrs. Morris), New York, N. Y.
 Carter, Mary E., private nurse, Rippon, W. Va.
 Carter, Elizabeth V., head nurse, Mercy Hospital, Philadelphia, Pa.
 Grant, Anna E. (Mrs. Millen), Savannah, Ga.
 Gilmore, Mary E., private nurse, Leavenworth, Kans.
 James, Aleathia D. (Mrs. Franklin), Jacksonville, Fla.
 Jeffries, Emma M., private nurse, Redbank, N. J.
 Jones, Violet, private nurse, Hartford, Conn.
 Lewis, Louzetta (Mrs. Mitchell), Montgomery, Ala.
 Richardson, Effie V. (Mrs. McCoy), Washington, D. C.
 Thomas, Marie E. (Mrs. Jones), Topeka, Kans.

1905.

Braxton, Margaret, private nurse, Hartford, Conn.
 Brooks, Alpha E. (Mrs. Jones), Fairmont Heights, D. C.
 Carter, Marion M., private nurse, Washington, D. C.
 Henderson, Hattie E., private nurse, Cleveland, Ohio.
 Holmes, Julia E., private nurse, Plainfield, N. J.
 Jefferson, Roxanna M., private nurse, Bristol, Tenn.
 Kidd, Bertha M. (Mrs. Harris), Washington, D. C.
 Long, Ida E., private nurse, Newark, N. J.
 Maston, Mary J., head nurse, Red Cross Sanitarium, Louisville, Ky.
 Scott, Julia E., private nurse, New Haven, Conn.
 Teabout, Stella, private nurse, Richfield Springs, N. Y.

Taliaferro, Olivia, private nurse, Anacostia, D. C.
 Terry, Jessie C., private nurse, Los Angeles, Calif.
 Williams, Daisy M. (Mrs. Moten), Sherman, Tex.
 Williams, Mary T., private nurse, Ware Neck, Va.
 Wilson, Annabel, private nurse, Baltimore, Md.

1906.

Barnes, Annie, private nurse, Baltimore, Md.
 Bearce, Daisy M., private nurse, Rye, N. Y.
 Burress, Mary E. (Mrs. Wormley), Ardwick, S. C.
 Gordon, Mary B., private nurse, Washington, D. C.
 Hall, Iona M., private nurse, Troy, Ohio.
 Henderson, Sara O., private nurse, Newport, R. I.
 Johnson, Harriett C., private nurse, Cleveland, Ohio.
 Lewis, Willie A., private nurse, Atlanta, Ga.
 Lucas, Marion V. (Mrs. Monroe), Washington, D. C.
 McDougal, Colota M., district nurse, Indianapolis, Ind.
 McKnight, Viola, superintendent of nurses, Mercy Hospital, Philadelphia, Pa.
 Marshall, Mary E., private nurse, Morristown, Tenn.
 Merritt, Mary E., superintendent of nurses, Mitchell Hospital, Leavenworth, Kans.

1907.

Bullock, Blanche V., private nurse, Richmond, Va.
 Childs, Helen D., private nurse, Philadelphia, Pa.
 Escoffery, Lula M., private nurse, Atlantic City, N. J.
 Harmon, Nannie M., private nurse, Tip Top, Va.
 Porter, Susan H., dean woman's department, Tuskegee, Ala.
 Payton, Lillian M., public school nurse, Washington, D. C.
 Peck, Alice M. (Mrs. Anderson), Boston, Mass.
 Rose, Julia M., private nurse, Lynchburg, Va.
 Slocum, Mary E., private nurse, Providence, R. I.
 Smith, Minnie M., private nurse, Amherst, Mass.
 Taylor, Loretta P. (Mrs. Banks), Washington, D. C.
 Wright, Nena J. (Mrs. Jackson), New York City.

1908.

Briggs, Cornelia K., private nurse, Troy, N. Y.
 Denning, Clara S. (Mrs. Robinson), Baltimore, Md.
 Douglas, Kate E. (Mrs. Barter), Newark, N. J.
 Donaldson, Vesta I., private nurse, Ocean Grove, N. J.
 Fray, Julia (Mrs. Clark), Chicago, Ill.
 Henderson, Jamima S., private nurse, Spring Lake, N. J.
 Jones, Bertie L., deceased.
 Nicholas, Beatrice E., private nurse, Baltimore, Md.
 Proctor, Eva M., private nurse, Newark, N. J.
 Robinson, Alice E., private nurse, Harts-ville, S. C.
 Reynolds, Agnes, private nurse, Ironton, Ohio.

1909.

Allen, Irene P. (Mrs. Martin), deceased.
 Burnett, Sarah L., private nurse, Wash-ington, D. C.
 Coates, Nana E., Battle Creek, Mich.
 Curtis, Minnie M., private nurse, Mari-etta, Ohio.
 Green, Lillian C. (Mrs. Davis), Washing-ton, D. C.
 • Hall, Anita B., private nurse, Baltimore, Md.
 Hankle, Areatha B. (Mrs. Bailey), St. Louis, Mo.
 Johnson, Lillian A., private nurse, Pough-keepsie, N. Y.
 Lewis, Charlotte M., private nurse, At-lanta, Ga.
 Parker, Mary E., private nurse, Williams-port, Pa.
 Sheppard, Emma D., private nurse, Mey-ersdale, Pa.
 Smith, Annie M., private nurse, Jackson-ville, Fla.
 Spears, Lillian, private nurse, Provid-ence, R. I.
 Wainwright, Melinda E., Charles Town, W. Va.

1910.

Amby, Grace, married, Baltimore, Md.
 Brown, Nellie V., private nurse, Meyers-dale, Pa.
 Howard, Mrs. Sankey B., Goldshoro, N. C.
 Gates, Eugene J. P., private nurse, Wash-ington, D. C.
 Gilliam, Octavia T., private nurse, Han-over, Va.
 Hutchinson, Mabel M., private nurse, Lockport, N. Y.
 Jackson, Sara E., private nurse, Steelton, Pa.
 Jordan, Maggie M., private nurse, Wash-ington, D. C.
 McLaine, Nettie L. (Mrs. George), Padu-cah, Ky.

Richardson, Lizzette S., private nurse, Washington, D. C.
 Reid, Marion M., private nurse, Denver, Colo.

1911.

Blackburn, Clara E. (Mrs. Miller), Wheel-ing, W. Va.
 Clay, Eva Virginia, Central State Hos-pital, Petersburg, Pa.
 Coates, Edna May (Mrs. Gloster), visiting nurse, Brooklyn, N. Y.
 Green, Emily Estelle (Mrs. Allen), Wash-ington, D. C.
 Grishy, Sara Elizabeth, private nurse, Washington, D. C.
 Harris, Florence M., visiting nurse, Brooklyn, N. Y.
 Hopkins, Jennie C., private nurse, New York City.
 Patton, Jesse Boyd, superintendent of nurses, Mercy Hospital, Nashville, Tenn.
 Piper, Ida J. (Mrs. Robinson), Boston, Mass.
 Price, Mae Irene (deceased).
 Stevens, Nettie Bentley, private nurse, Atlanta, Ga.
 Thompson, Lulu E., head nurse, Freed-men's Hospital, Washington, D. C.
 York, Martella M., head nurse, Freed-men's Hospital, Washington, D. C.

1912.

Abner, Carrie (Mrs. Bumbry), Chicago, Ill.
 Butler, Marguerite C. (Mrs. Scott), Phil-adelphia, Pa.
 Carter, Elizabeth F. A., Public Health nurse, San Antonio, Tex.
 Christian, Estella A., private nurse, Richmond, Va.
 Eaton, Sadie E., private nurse, Raleigh, N. C.
 Simmons, Mary A. (Mrs. Moore), Mag-nolia, N. J.

1913.

Anderson, Maude H., private nurse, Philadelphia, Pa.
 Barnes, Mayme, Central State Hospital, Petersburg, Va.
 Berkley, Pearl B., private nurse, Wash-ington, D. C.
 Davis, Alice E., private nurse, Frederick, Md.
 Elliott, Frances R., Public Health nurse, Jackson, Tenn.
 Garrott, Roberta Lee, private nurse, Washington, D. C.
 Green, Cecilia M. (Mrs. Martin), Wash-ington, D. C.
 Henry, Eva G., private nurse, Wilming-ton, Del.
 Howland, Elizabeth B., head nurse, Freedmen's Hospital, Washington, D. C.
 Jackson, Edna V. (Mrs. Brooke), Kansas City, Mo.

Jordan, Emily M., private nurse, Washington, D. C.
 Kemper, Etta C., Barnett Hospital, Huntington, W. Va.
 Lawson, Bessie M., private nurse, Pittsburgh, Pa.
 Meredith, Angie E. (deceased).
 Ockrey, Minnie, visiting nurse, Newark, N. J.
 Russell, Josephine M., private nurse, Washington, D. C.
 Wingate, Elizabeth E., private nurse, Charleston, S. C.

1914.

Byrd, Carrie Lena, head nurse, Tidewater Hospital, Tidewater, Va.
 Cargyle, Laura Aurelia, private nurse, Atlanta, Ga.
 Clark, Ophelia Elizabeth, private nurse, Indianapolis, Ind.
 Jackson, Alice Veronica, head nurse, Provident Hospital, Baltimore, Md.
 Jordan, Blanche Lillian, private nurse, Washington, D. C.
 Minor, Ethel Mae (Mrs. Bingham), Washington, D. C.
 Munda, Maude E., private nurse, Richmond, Va.
 Robinson, Adaline, private nurse, Kansas City, Mo.
 Shelton, Willie Belle, private nurse, Buffalo, N. Y.
 Smith, Lena Mae (Mrs. Sampson), Washington, D. C.
 Thompson, Edna Sylvia, private nurse, New York City.
 Varner, Amanda Evalina, private nurse, Atlanta, Ga.
 Walker, Olive Glennie, Public Health Service, Cleveland, Ohio.
 Williamson, Lulu Howard (Mrs. Kinglow), Bluefield, W. Va.

1915.

Benson, Katherine Zada, private nurse, Washington, D. C.
 Brown, Marion Hilda, private nurse, Bluefield, W. Va.
 Johnson, Helen Clotilda, private nurse, Wilkes-Barre, Pa.
 Lovett, Caroline Beatrice (Mrs. Terry), Washington, D. C.
 Martin, Alice Ellen, private nurse, Birmingham, Ala.
 Owen, Christie Elaine (deceased).
 Sheppard, Mary J., private nurse, Meyersdale, Pa.
 Spurlock, Pearl Mabel, private nurse, Pittsburgh, Pa.

1916.

Clifford, Helen Healy (Mrs. Jackson), Harpers Ferry, W. Va.
 Gill, Edith Berncenia (Mrs. Milard), Washington, D. C.

Graham, Carrie Francis, private nurse, Boston, Mass.
 Hammie, Lola Montice, private nurse, Washington, D. C.
 Holmes, Cora Lee (Mrs. Hester), Norfolk, Va.
 Lightfoot, Josephine Julia, private nurse, Berryville, Va.
 May, Charlotte King, private nurse, Holton, Kans.
 Marsh, Louise Veronica (Mrs. Lucas), Norfolk, Va.
 Minnie, Nancy Jeanette, private nurse, Norfolk, Va.
 Scott, Irene Rhodelia, private nurse, Atlanta, Ga.
 Smith, Georgia Penn (Mrs. Reed), Washington, D. C.
 Walker, Fannie Geneva, private nurse, Lockland, Ohio.
 Weeks, Mary Viola, private nurse, Norfolk, Va.
 Yeatman, Lucille Bernice, private nurse, Philadelphia, Pa.

1917.

Boulding, Susie M., private nurse, Washington, D. C.
 Butler, Josephine M., private nurse, Hutchinson, Kans.
 Brown, Irene, private nurse, Washington, D. C.
 Chambers, Alice, private nurse, Baltimore, Md.
 Cole, Aileen, private nurse, Washington, D. C.
 Doyle, Mabel (Mrs. Keating), New York.
 Edwards, Esther, private nurse, Washington, D. C.
 Gillard, Lenore (Mrs. Kizer), Washington, D. C.
 Harris, Sarah E., private nurse, Galveston, Tex.
 James, Pauline (Mrs. Curtis), Washington, D. C.
 Jones, Harriet W., private nurse, New York.
 Lacount, Gertrude, private nurse, Providence, R. I.
 Moses, Florence, private nurse, Washington, D. C.
 Porter, Beatrice, private nurse, Chicago, Ill.
 Smith, Inez, private nurse, Chicago, Ill.
 Walker, Louise, private nurse, Galveston, Tex.
 West, Jeanette, private nurse, Richmond, Va.
 White, Arline, private nurse, Fayetteville, N. C.
 Hill, Sophia, private nurse, Asbury Park, N. J.
 Yancy, Edith, private nurse, Washington, D. C.

1918.

Coulbourne, Susie, private nurse, Washington, D. C.
 Garbon, Marion, Y. M. C. A. work, Paris, France.
 Harris, Nellie, private nurse, Washington, D. C.
 Smith, Pearl M., visiting nurse, Washington, D. C.
 Starks, Callie McGuinn, private nurse, Washington, D. C.
 Strothers, Josephine, private nurse, Abington, Va.
 Turnquest, Ruth, head nurse, Burrell Memorial Hospital, Roanoke, Va.
 Wallace, Pearl, private nurse, Jacksonville, Fla.

1919.

Bell, Ruth, private nurse, St. Joseph, Mo.
 Branford, Mae Brown (Mrs. Hurst), Washington, D. C.

Byrd, Georgia Frankie, Children's Hospital, Wilmington, Del.
 Culberson, Esther Bell, private nurse, Clinton, Iowa.
 Davis, Bertha Mae, Instructive Visiting Nurse Society, Washington, D. C.
 Freeman, Ruth, private nurse, Painsville, Ohio.
 Gears, Amelia Jackson, private nurse, Providence, R. I.
 Johnson, Othelia Ruth, Dr. Carson's Hospital, Washington, D. C.
 Legall, Marcena, Booker Washington Hospital, New York City.
 White, Rhonie, private nurse, Washington, D. C.
 Wooten, Edna, private nurse, Painsville, Ohio.
 Worsham, Isabel, private nurse, Piqua, Ohio.
 Wyns, Lilly Mae, private nurse, Atlanta, Ga.

Very respectfully,

W. A. WARFIELD,
Surgeon in Chief.

The SECRETARY OF THE INTERIOR.

DEPARTMENT OF THE INTERIOR

R E P O R T

OF THE

PRESIDENT OF HOWARD UNIVERSITY

TO THE

SECRETARY OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED JUNE 30, 1920



**WASHINGTON
GOVERNMENT PRINTING OFFICE
1920**

ROSTER OF OFFICERS.

BOARD OF TRUSTEES FOR 1919-1920.

Ex-Chief Justice STANTON JUDKINS PEELE, LL. D., *president.*
JAMES STANLEY DURKEE, A. M., Ph. D., D. D., *president of the university.*
EMMETT J. SCOTT, A. M., LL. D., *secretary-treasurer.*

Term Expires 1921.

Justice GEORGE WESLEY ATKINSON, LL. D., Washington, D. C.
ROLFE COBLEIGH, Boston, Mass.
Rev. HARLAND PAUL DOUGLASS, D. D., New York City.
ANDREW FRANKLIN HLYER, A. B., LL. M., Washington, D. C.
Ex-Chief Justice STANTON JUDKINS PEELE, LL. D., Washington, D. C.
Rev. ULYSSES GRANT BAKER PIERCE, D. D., Washington, D. C.
Rev. CHARLES HERBERT RICHARDS, D. D., New York City.
Hon. THEODORE ROOSEVELT, Jr., Oyster Bay, N. Y.

Term Expires 1922

Justice JOB BARNARD, LL. D., Washington, D. C.
CHARLES R. BROWN, D. D., LL. D., New Haven, Conn.
WILLIAM VAN ZANDT COX, A. M., Washington, D. C.
Rev. FRANCIS JAMES GRIMKE, D. D., Washington, D. C.
ALBERT BUSHNELL HART, Ph. D., LL. D., Litt. D., Cambridge, Mass.
CUNO HUGO RUDOLPH, Washington, D. C.
WILLIAM ALBERT SINCLAIR, M. D., Philadelphia, Pa.
Bishop JOHN HURST, D. D., Baltimore, Md.

.Term Expires 1923.

JOHN THOMPSON EMLIN, Philadelphia, Pa.
THOMAS JESSE JONES, Ph. D., Washington, D. C.
Rev. JESSE EDWARD MOORLAND, D. D., New York City.
CHARLES BURLEIGH PURVIS, M. D., Boston, Mass.
Justice WENDELL PHILLIPS STAFFORD, Washington, D. C.
MARCUS FITZHERBERT WHEATLAND, M. D., Newport, R. I.

HONORARY BOARD.

JOHN ADAMS COLE, Chicago, Ill.
Bishop BENJAMIN FRANKLIN LEE, D. D., Wilberforce, Ohio.
HENRY PELLEW, Washington, D. C.
Hon. JOSEPH DRAFER SAYERS, Austin, Tex.
Hon. WILLIAM HOWARD TAFT, LL. D., New Haven, Conn.
Bishop BENJAMIN TUCKER TANNER, LL. D., Philadelphia, Pa.
Bishop WILBUR PATTERSON THIRKIELD, LL. D., New Orleans, La.

PATRON EX OFFICIO.

Hon. JOHN BARTON PAYNE, Secretary of the Interior.

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REPORT OF THE PRESIDENT OF HOWARD UNIVERSITY

TO THE SECRETARY OF THE INTERIOR.

HOWARD UNIVERSITY,
Washington, D. C., July 1, 1920.

SIR: I have the honor to submit for Howard University the following report, showing the condition of the institution on the 1st day of July, 1920, "embracing therein the number of pupils received and discharged or leaving the same for any cause during the year, and the number remaining; also the branches of knowledge and industry taught and the progress made therein, together with a statement showing the receipts of the institution, and from what sources, and its disbursements, and for what objects."

THE UNIVERSITY ORGANIZATION.

Beginning with the school year of 1919-20, the plan of collegiate work was revised and, in order that the registration figures may be understood, is here briefly sketched.

The college course of four years is divided into two parts of two years each. The first two years comprise the "Junior college." Here are taught those subjects which are the basis of a liberal education. The second two years comprise the "Senior schools." Here are taught those special subjects which fit the student for special work. Courses in the junior college will fit the student to enter the senior schools of liberal arts, education, journalism, commerce and finance or physical education, or he may go to graduate schools of law, medicine, or theology. The school of applied science demands its own full four years' course, while the courses in the school of music are taken in combination with the academic courses. Emphasis is laid upon the full four years' liberal arts course, but opportunity is given to specialize during the last two years, thus fitting the student to go at once to his life's task and at the same time have his college degree. Courses leading to the degree of M. A. have also been established under the supervision of a committee on graduate studies.

REGISTRATION.

In spite of the discontinuance of all secondary work, the registration for the year showed an increase of 207 over that of last year. The net total registration was 1,567, representing 38 different States and 10 foreign countries.

Students during year ended July 1, 1920.

Junior college.....	558
School of liberal arts.....	98
School of education.....	34
School of commerce and finance.....	6
School of applied science.....	70
School of music.....	42
Certificate courses in music.....	59
Post graduates.....	3
School of religion.....	88
Certificate courses in religion.....	130
School of medicine.....	383
School of law.....	124
	<hr/>
	1,595
Deducted for duplication.....	28
	<hr/>
Net total.....	1,567

The total number graduated was 181, distributed as follows:

Graduates in 1920.

School of liberal arts.....	64
School of education.....	19
Normal course.....	3
School of applied science.....	4
Two-year course.....	4
School of music.....	1
School of religion.....	9
School of medicine:	
Medical college.....	27
Dental college.....	26
Pharmaceutic college.....	9
	<hr/>
	62
School of law.....	14
Graduate studies, M. A. degree.....	1

GRADUATE SCHOOLS.**(I) THE SCHOOL OF MEDICINE.**

The Howard University school of medicine has continued on the same high plane as in past years. The demoralization incident to war has practically ceased. The school is divided into three departments—medical, dental, and pharmaceutic. The dental department showed an unprecedented increase in students, the entering class numbering 114. The great need is for a new building for this department, as the present building is a relic of the Civil War and can not much longer house this school.

The registration for 1919-20 was as follows: Medical, 113; dental, 222; pharmaceutic, 48; total, 383. Of these, 72 received degrees as follows: M. D., 27; D. D. S., 36; Ph. C., 9.

(II) THE SCHOOL OF LAW.

The Howard University school of law, located at 420 Fifth Street NW., was incorporated March 2, 1867, by act of Congress. The purpose of this school is the preparation of students for practice at the bar, for making them better citizens and more efficient civil servants, a large number of whom are employed by the Government. The prescribed course of study is three years, leading to the degree of LL. B. The enrollment for 1919-20 was the largest in the history of the school, being 124, and classified as follows:

	Men.	Women.	Total.
Juniors.....	73	7	80
Middlers.....	27	3	30
Seniors.....	14		14
			124

The graduates for the year numbered 14.

(III) THE SCHOOL OF RELIGION.

The primary purpose of the school of religion has been from the beginning to prepare men for the active pastorate. Two other purposes have been before those in authority, namely, to broaden the vision and to deepen the religious life of those who were to make teaching their profession and to equip those dedicated to the missionary field with the outlook and knowledge, which would assist them in the difficult but splendid task.

The roll of students for the year was as follows: Resident students, 48; correspondence students working for degree or diploma, 40; correspondence students unclassified, 130; making a total under instruction of 218. Of these, 6 received the degree of B. D. and 3 received diplomas.

This school receives no aid whatsoever from Government funds.

ACADEMIC SCHOOLS.

JUNIOR COLLEGE.

The junior college, comprising the freshman and sophomore years, enrolled 558 students for the year, 400 of whom have already indicated their choice for a particular senior school. This fact in itself is an outstanding proof of the value of the new academic organization. As the school year is divided into three quarters, the total registration by quarters is here given:

First quarter (October, November, December).....	618
Second quarter (January, February, March).....	640
Third quarter (April, May, June).....	558

Further statistics for the third, or spring, quarter show:

Freshmen.....	414
Sophomores.....	105
Unclassified.....	39
	<hr/>
	558
Number of men.....	454
Number of women.....	104

SCHOOL OF LIBERAL ARTS.

The school of liberal arts comprises the work of the third and fourth years of students pursuing studies in the arts and sciences. Students are always advised to take their four college years in the arts and sciences when it is possible for them to devote the time needed, before entering upon specialized study, that they may have a broader foundation for such study.

In view of the valuable services rendered by Howard University during the Great War and in consideration of the advantages derived from the experience of participating in this world-wide upheaval, the trustees and the faculty granted a half unit for every month of such military service to the amount not exceeding 9 units. This made possible the graduation of a much larger class. The enrollment for the year was as follows:

Juniors.....	60
Seniors.....	31
Specials.....	7
	<hr/>
	98

Of these, 41 received the degree of A. B. and 23 the degree of B. S.

SCHOOL OF EDUCATION.

Under the reorganized administration the work in the school of education is confined to the junior and senior years, and while the new scheme greatly reduces the numbers, yet it has the advantage of furnishing a very much greater opportunity for concentrated effort in the field of education, both on the part of faculty and students. The greater emphasis upon subject matter in the special field of education enables the school to prepare and to send into the world a very much better qualified teacher than heretofore; also it is worthy of note that our school work has been greatly intensified by adoption of the quarter divisions of the school year with its accompanying closer continuity of recitations.

One of the greatest needs of the school of education is a better opportunity to carry on observation and practice teaching. Permission has been secured from the school authorities to observe in the high

schools of the city, but not to practice, which is more important. Our students have cooperated in this small opportunity so laudably, however, that some of them have made themselves so useful that they have been allowed to practice, and even called upon to act as substitutes in the absence of the regular teacher. Under supervision of the school four of the students have been conducting study classes at the Miner Normal School under the auspices of the community center.

All of the members of the graduating class of 1919 secured positions and all, with one exception, secured positions in their chosen field. We have not been able to fill one-fourth of the applications made to us this year for teachers in secondary schools, the requests coming from every part of the country, though particularly from the South.

The enrollment in the school for the year 1919-20 was as follows:

Seniors.....	19
Juniors.....	12
Specials (2-year normal course).....	3
Total.....	34

Of these, 10 received the degree of A. B. in education and 9 the degree of B. S. in education.

SCHOOL OF APPLIED SCIENCE.

A keener interest than ever before is being manifested by students who are registered in this school. This is doubtless due to the increased opportunities for employment in technical work of collegiate grade as well as our increased facilities for instruction.

With the opening of the current school year, the department of architecture began its career with an enrollment of seven students. An architectural library is most essential for the proper conduct of the work.

The rooms occupied by the department of home economics have been redecorated, thus giving them an attractive appearance. One large room has been partitioned in such a way as to form a model apartment, which is being used for instructional purposes in serving, household management, etc. The enrollment of the school was as follows:

Freshmen.....	27
Sophomores.....	23
Juniors.....	7
Seniors.....	9
Specials.....	4
Total.....	70

Of these, four received the degree of B. S. in home economics and four received the two-year certificate in home economics.

SCHOOL OF COMMERCE AND FINANCE.

The foundation and motive of this school is to meet a very present and pressing demand for young colored people to gain expert knowledge and practice in commercial and mercantile life. The curriculum of the school is based purely upon the idea of specialization along business lines in the broadest sense. The growing wealth, business activity, and political influence of the colored people of the United States have brought the attention of a large number to the wisdom of choosing for their life work such honorable pursuits as engagement in economic, manufacturing, and mercantile affairs. It is plain that the colored people of the United States must progress as citizens and as members of the economic forces of the country. Without such conviction there would be very little incentive for progress and none for good citizenship. Howard University in recognizing these facts has acted wisely in attempting to give opportunity for the colored youth to gain theory and practice along these lines.

Because the school was in its first year of organization the registration showed but seven students. The indications for next year, however, are that there will be a large number coming from the junior college into this particular school.

SCHOOL OF MUSIC.

The school of music has had a most successful year, having an enrollment of 101, one of whom graduated with the degree of Mus. B. Many students take music in combination with their other work. During the year two presentations of Coleridge-Taylor's *Hiawatha* were given, one in Washington and one in Baltimore, both being very successful musically and financially.

SCHOOL OF GENERAL SERVICE.

Under this school are grouped several miscellaneous departments.

Maj. M. T. Dean, Infantry, United States Army, commandant of the University Reserve Officers' Training Corps, is also director of the department of physical education. The report of this department follows:

(1) The department of physical education offers every advantage possible with its meager facilities for the physical development of the student, both male and female. Due to a lack of gymnasium equipment and facilities very little indoor work can be given. Activities in athletics during the year with other universities and colleges have met with the hearty support of all interested in the university. Football, baseball, basket ball, and track and field teams have been engaged in their several intercollegiate contests. For the first time in our history a relay team entered the Penn relay race at Philadelphia May 1, 1920. Every encouragement is given

athletics in every way possible consistent with its rightful place in the university.

(2) The Reserve Officers' Training Corps unit is organized as a battalion of 5 companies, with a strength during the first quarter of the school year of 398; second quarter, 411; third quarter, 361. All battalion and company officers are students. Military training is compulsory for the first two years. A very great need for adequate drilling ground, both indoors and out, is felt, and the work greatly hampered because of the lack of such facilities. The unit sent to the summer camp at Camp Custer, Mich., for six weeks' special training 40 cadets, including 4 for the advanced course. With the opening of the school year 1920-21 it is expected that more than 50 students will be eligible to enter the advance course, in which commutation is paid by the War Department.

The university printing press deserves very honorary mention for the year, and though handicapped by lack of equipment and helpers. shows the amount of work done valued at approximately \$6,500. The work done is of course for the various departments of the university itself.

The university library shows the following accessions:

Volumes in library May 1, 1919.....	35, 518
Accessions recorded during year.....	1, 798
Present number of volumes.....	37, 316

As courses in Italian were offered for the first time, a beginning was made toward a collection of Italian literature. Dr. J. E. Moorland has added to his valuable collection a great many volumes and pamphlets, including many interesting periodicals and annuals relating to the Young Men's Christian Association. An interesting gift and one worthy of note is that of a very handsome edition of the Catholic Encyclopedia, presented by the children of St. Augustine's Church, of Washington. Books, books, and still more books are the great outstanding need, that we may have a suitable and adequate collection for college and university reference work.

SCHOOL OF JOURNALISM.

The school of journalism has been established to give thorough training to students interested in newspaper and magazine work. As this is a senior school and just recently established, there were no graduates for the year, but an ever increasing number of applicants are proving the need for this line of work. No effort will be made to restrict the work in journalism to one field, but will give all the fundamentals necessary for the making of a newspaper man.

HONORARY DEGREES.

The board of trustees voted unanimously at its annual meeting, June 3, 1920, to confer honorary degrees upon the following-named

persons, and they were so conferred at the commencement exercises, June 11, 1920:

Mus. D. Mr. Harry Thacker Burleigh, New York City.

LL. D. President John Hope, Morehouse College, Atlanta, Ga.

REPORT OF THE TREASURER.

The financial statement for the year 1919-20 is appended. The auditing of all our accounts has been done by chartered accountants. The expenditure of all money appropriated for our use by Congress takes place under the rigid supervision of the Department of the Interior.

J. STANLEY DURKEE, *President*.

FINANCIAL REPORT.

Expenditure of appropriation for maintenance, fiscal year ended June 30, 1920.

Administration:

President, in part.....	\$4,050.00	
Secretary-treasurer, in part.....	4,125.00	
Registrar and professor of pedagogy, in part.....	2,016.63	
Assistant treasurer, in part.....	1,583.30	
		<hr/> \$11,774.93

College:

One dean of senior college, in part.....	2,160.00	
One dean of junior college, in part.....	2,044.00	
One dean of school of commerce and finance, in part.....	2,025.00	
One dean of men, in part.....	2,025.00	
One acting dean of school of education, in part.....	900.00	
One professor of mathematics, in part.....	1,782.00	
One professor of physics, in part.....	1,710.00	
One professor of history, in part.....	1,593.00	
One professor of Latin, in part.....	1,593.00	
One professor of biology, in part.....	1,593.00	
One professor of mathematics, in part.....	1,548.00	
One professor of German and Greek, in part.....	1,530.00	
One professor of history, in part.....	1,530.00	
One professor of mathematics, in part.....	1,530.00	
One professor of chemistry, in part.....	1,143.00	
One professor of zoology, in part.....	1,012.50	
One professor of English, in part.....	434.00	
One associate professor of elementary education, in part.....	1,458.00	
One associate professor of public speaking, in part.....	1,350.00	
One assistant professor of English, in part.....	1,350.00	
One assistant professor of finance, in part.....	1,350.00	
One assistant professor of chemistry, in part.....	1,260.00	
One assistant professor of philosophy, in part.....	1,170.00	
One instructor in physical education, in part.....	1,350.00	
One instructor in English, in part.....	1,080.00	
		<hr/> 36,520.50

Conservatory of music:

One director and professor of singing, in part.....	1,530.00	
One professor of pianoforte, in part.....	1,350.00	
One assistant professor of piano, etc., in part.....	1,170.00	
One instructor in piano and voice, in part.....	900.00	
One instructor in piano, etc., in part.....	765.00	
		<hr/> 5,715.00

Library:

One librarian, etc., in part.....	\$2,052.00
One assistant librarian, in part.....	816.00
One assistant librarian, in part.....	693.00
One assistant librarian, in part.....	648.00

\$4,209.00

One secretary to the president, in part.....	1,260.00
One chief clerk, in part.....	1,041.60
One clerk, in part.....	918.00
One cashier, in part.....	833.30
One telephone operator, in part.....	783.30
One preceptress, in part.....	783.00
One clerk, in part.....	770.00
One clerk, in part.....	762.17
One superintendent of buildings and grounds, in part.....	758.31
One clerk, in part.....	720.00
One mechanic, in part.....	700.00
One clerk, in part.....	682.50
One clerk, in part.....	650.00
One resident head of Clark Hall, in part.....	450.00
One assistant preceptress, in part.....	369.00
One chaperon, in part.....	279.00
One clerk, in part.....	83.33

11,843.51

School of law:

Dean and lecturer on constitutional law, in part.....	875.00
One lecturer on torts, crimes, etc., in part.....	1,312.50
One lecturer on evidence, etc., in part.....	1,312.50
One lecturer on real property, in part.....	787.50
One lecturer on partnership, in part.....	787.50
One lecturer on jurisprudence, in part.....	656.24
One instructor in contracts, "Case System," in part.....	300.00
One lecturer on negotiable instruments, in part.....	218.75

6,249.99

Total salaries.....

76,312.93

Stationery.....

124.82

Total.....

76,437.75

Expenditure of appropriation for manual arts and applied sciences.

One director.....	\$2,500.00
One instructor in architecture.....	1,800.00
One instructor in domestic science.....	1,800.00
One instructor in shopwork and drawing.....	1,400.00
One instructor in domestic arts.....	1,200.00
One instructor in printing.....	1,200.00
One instructor in civil engineering.....	1,199.97
One professor of applied biology.....	1,000.00
One instructor in electrical engineering.....	384.00
One instructor in electrical engineering, in part.....	361.67
One clerk.....	800.00
One janitor.....	810.00
One janitor.....	19.97

\$14,475.61

Equipment.....

1,814.09

Supplies.....

3,710.30

20,000.00

Distribution of expenditures from Government appropriations.

Appropriations.	Amount.	Expenditures.	
		Current fund.	Permanent plant fund.
Disbursed through chief clerk of Interior Department:			
Maintenance, salaries, etc.....	\$76,437.75		
Salaries.....		\$76,312.93	
Stationery.....		124.82	
Department of manual arts, apparatus, and material.....	20,000.00	18,185.91	\$1,814.09
Libraries, equipment, books, etc.....	1,500.00		
Law.....		140.00	175.48
Academic and medical.....		1.00	1,183.52
Improvement of grounds and repairs of buildings.....	10,000.00	10,000.00	
School of medicine, repairs to laboratory, supplies, and equipment.....	7,000.00	4,684.30	2,315.70
Laboratories, materials, and apparatus.....	2,000.00	836.36	1,163.74
Fuel and light.....	5,000.00	5,000.00	
Total credited permanent fund account.....			6,652.53
Total credited current fund.....		115,285.22	115,285.22
Total appropriation.....	121,937.75		121,937.75

Expenditure of appropriation for natural-history studies and laboratories.

Chemical laboratory.....	\$997.42
Biological laboratory.....	323.07
Physics laboratory.....	577.28
Nature-study laboratory.....	102.23

Total..... 2,000.00

Expenditure of appropriation for repairs of buildings and improvement of grounds.

Repairs to buildings.....	\$9,747.38
Improvement of grounds.....	252.62

Total..... 10,000.00

Expenditure of appropriation for libraries.

Academic and medical library books, etc.....	\$1,184.52
Law library books, etc.....	315.48

Total..... 1,500.00

Expenditure of appropriation for fuel and light.

Fuel and labor, central heating plant.....	\$4,600.00
Other fuel.....	400.00

Total..... 5,000.00

Expenditure of appropriation for school of medicine.

Equipment and apparatus.....	\$2,315.70
Laboratory supplies.....	1,835.08
Repairs to laboratories and buildings.....	2,849.22

Total..... 7,000.00

*Balance sheet as at June 30, 1920.***ASSETS.****Current assets:**

Cash in banks and on hand.....	\$14,408.20	
Students' debit balances.....	\$11,361.81	
Less reserve for bad accounts.....	2,177.56	
	<u>9,184.25</u>	
Accounts receivable.....	2,500.02	
Inventories of supplies on hand.....	4,112.66	
Total current assets.....		\$30,205.13

Deferred assets:

Unexpired insurance.....		1,902.03
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Educational plant:

Land at June 30, 1919.....	616,057.47	
Additions during year.....	181.26	
	<u>616,238.73</u>	
Buildings.....		624,361.52
Equipment at June 30, 1919.....	174,633.47	
Additions during year.....	10,838.77	

	<u>185,472.24</u>	
Less sundry sales and deductions.....	1,033.76	
	<u>184,438.48</u>	

Total educational plant.....		1,425,038.73
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Investment of trust funds:

Real estate, mortgages, and other securities.....	300,421.71	
Unproductive land.....	93,571.99	
Cash in bank.....	14,452.06	
Total investment of trust funds.....		408,445.76
		<u>1,865,591.65</u>

LIABILITIES AND FUNDS.**Current liabilities:**

Notes payable.....	\$35,000.00	
Accounts payable.....	5,559.36	
Students' credit balances.....	4,463.38	
Total current liabilities.....		\$45,022.74

General capital funds:

Plant capital.....	<u>1,425,038.73</u>	
--------------------	---------------------	--

Current deficit—

The general deficit.....	33,138.75	
The medical school surplus.....	13,004.52	
	<u>20,134.23</u>	

Unexpended balances—

Special funds.....	4,155.25	
Reserve for losses on endowment fund investments.....	3,063.40	
	<u>7,218.65</u>	

Total general capital funds.....		1,412,123.15
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Trust funds:

Permanent endowment funds.....	313,045.39	
Land fund (unrestricted).....	95,400.37	
Total trust funds.....		408,445.76
		<u>1,865,591.65</u>

*Income and expenditure account for the year ended June 30, 1920.***EXPENDITURE.****Instruction:**

Junior and senior colleges.....	\$66,922.13	
Academic laboratories.....	7,868.57	
School of theology.....	7,614.87	
School of law.....	10,063.26	
School of medicine.....	54,042.12	
Conservatory of music.....	9,183.24	
School of manual arts and applied sciences.....	20,838.90	
Library.....	7,067.03	
		<u>\$183,600.12</u>
School of general service.....		4,371.33
Net cost of dormitories.....		5,211.78
Net cost of dining hall.....		2,187.44
Maintenance.....		27,712.71
Administration.....		43,529.58
Student aid.....		3,263.74
Miscellaneous.....		6,275.53
		<u>276,152.23</u>
Total current expenditure.....		276,152.23
Improvements and additions to plant.....		11,020.03
		<u>287,172.26</u>
Total expenditure.....		287,172.26
Special funds, unexpended balances.....		70.83
		<u><u>287,243.09</u></u>

INCOME.

From students—tuition and other fees.....	\$105,556.40
From public funds—Federal Government appropriation.....	121,937.75
From endowment and other investments—rents and interest.....	16,444.18
From donations—various donors.....	4,182.70
From sundries.....	5,366.77
	<u>253,487.80</u>
Total income (Schedule I).....	253,487.80
Excess of expenditure over income for the year:	
The general fund.....	\$38,342.88
Less the medical school (surplus).....	4,587.59
	<u>33,755.29</u>
	<u>287,243.09</u>

Summary of all income and expenditure.

Expenditure as above.....	\$287,061.83
Additional expenditure:	
Boarding hall.....	\$43,023.64
Dormitories.....	13,758.51
	<u>56,782.15</u>
Total expenditure for all purposes.....	<u><u>343,843.98</u></u>
Income as above.....	253,487.80
Additional income:	
Boarding hall.....	\$43,023.64
Dormitories.....	13,758.51
	<u>56,782.15</u>
	<u><u>310,269.95</u></u>

Endowment funds June 30, 1920.

Endowment:

School of medicine.....	\$15,000.00	
Hartford reading room.....	425.00	
Henry G. Maynard prize debate.....	560.00	
Intercollegiate debating fund.....	88.50	
Gregory prize debate.....	100.00	
General endowment fund.....	160,530.42	
		<hr/> \$176,703.92

Professorships:

Stone professorship of theology.....	40,000.00	
Emily H. Moir theological professorship.....	24,400.00	
Ewell theological professorship.....	1,000.00	
School of theology alumni professorship.....	971.00	
Thaddeus Stevens professorship.....	2,200.00	
Grebel professorship.....	2,450.00	
Whittier professorship.....	875.00	
Alumni professorship.....	25.00	
Wm. H. Patton memorial professorship.....	12.10	
		<hr/> 71,933.10

Scholarship and student aid:

Martha Spaulding aid.....	8,828.26	
Frederick Douglass scholarship aid.....	8,503.11	
Francis B. Shoals scholarship aid.....	6,000.00	
William E. Dodge scholarship aid.....	5,000.00	
John W. Alvord scholarship aid.....	5,000.00	
Pomeroy scholarship.....	2,500.00	
Mary B. Patton scholarship aid.....	1,200.00	
Horace Ford scholarship aid.....	1,000.00	
J. K. McLean scholarship aid.....	1,000.00	
Orange Valley Church scholarship aid.....	1,000.00	
Wm. W. Patton scholarship aid.....	1,000.00	
Thomas Cropper Riley scholarship aid.....	1,000.00	
Elizabeth Shaw fund.....	1,000.00	
Lincoln memorial prize scholarship.....	700.00	
Edward Smith textbook fund.....	500.00	
J. P. Thompson scholarship aid.....	260.00	
Caroline Patton Hatch student aid.....	200.00	
Commercial (normal) department aid.....	155.68	
Wiley Lane student aid.....	50.00	
General scholarship and student aid.....	19,511.32	
		<hr/> 64,408.37
Total endowment funds.....		<hr/> 313,045.39

DEPARTMENT OF THE INTERIOR

REPORT

OF THE

SUPERINTENDENT OF THE
UNITED STATES CAPITOL BUILDING
AND GROUNDS

TO THE

SECRETARY OF THE INTERIOR

FOR THE

FISCAL YEAR ENDED JUNE 30, 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

REPORT OF THE SUPERINTENDENT UNITED STATES CAPITOL BUILDING AND GROUNDS.

OFFICE OF THE SUPERINTENDENT
UNITED STATES CAPITOL BUILDING AND GROUNDS,
Washington, D. C., August 20, 1920.

SIR: I beg to submit herewith a report of the work performed under this office for the fiscal year 1920:

SENATE WING.

Six rooms in the Senate terrace have been thoroughly repaired, repainted and decorated, rewired, modern plumbing installed with lavatories for the use of the Senate; in one of these rooms a metal ceiling replaced the former ceiling. The former stationery room has been repainted and three rooms subdivided from the space thus acquired, one of these rooms being added to the room of the Senate Committee on Foreign Relations, one to the Senate Committee on Appropriations, and one assigned to the majority whip.

The room in the old library space occupied by the storekeeper of the Senate has been rewired, woodwork restored, and the room redecorated. A partition has been placed in the room occupied by the page boys of the Senate, dividing the room and thus making an additional room for the use of the Senate. In the branch post office an inclosure has been constructed of partitions with glass panels. The Senate document room damaged by fire during the last week in January has been replastered, window frames and metal shelving repaired and restored, and the room rewired.

In the corridors of the basement floor of the Senate wing the work of the restoration of the decorations has been carried on during the year.

Electrical work in this section of the Capitol includes rewiring of the room of the Doorkeeper, the file room of the Senate Committee on Appropriations, the principal room of the Senate library, one small room of the law library, the room of the Joint Committee on Printing, rewiring of the ice machine, the coal vaults, and the hot-water room.

Under provisions contained in deficiency bill approved November 4, 1919, money was appropriated for the use of No. 23 B Street NW., formerly designated as the Old Telephone Building, as an addition to the space of the Senate folding room. The remodeling and repairs include a new heating arrangement and the connecting of the same to the heating plant of the Maltby Building; new plumbing with lavatories, closets, shower bath, necessary millwork to provide for the changed conditions of the rooms, overhauling and remodeling of the electric-lighting system, and providing for additional lighting service.

HOUSE WING OF THE CAPITOL.

A new compressor, new ammonia condenser, and new piping has been installed in connection with the refrigerating plant of the House restaurant. The superintendent's storeroom has been moved from the Senate terrace to the House terrace and the room fitted with necessary shelving. The electrician's storeroom has been moved from its former location in the basement of the central portion of the Capitol to the House terrace and the new quarters arranged and fitted up for the purposes of the electricians. Under this new arrangement all of the shops of the Capitol have been located convenient to the storeroom, thereby facilitating obtaining of necessary supplies for the many repairs required in various portions of the Capitol Building.

Electrical work in the House wing includes rewiring of the small room of the House Committee on Appropriations; installation of two ceiling and bracket lamps in the room of the House Committee on Foreign Affairs; ceiling bands in rooms of Committee on Rules, House Journal clerk, and in rooms assigned for offices to Members of the House. Ceiling bands installed in the disbursing office of the House, ceiling bands and brackets in the office of the Sergeant-at-Arms of the House, rewiring of the office of the Clerk of the House, and ceiling bands installed, the House kitchen and corridor, the shops of the terrace, and room 12 of the terrace rewired.

CHAMBER OF THE SUPREME COURT.

During the recess of the Supreme Court in 1919, the ceiling of the court room was removed and a new ceiling composed of material intended to improve the acoustics of this room installed retaining in detail the architectural and decorative features of the ceiling removed.

MISCELLANEOUS REPAIRS.

Work performed or repairs completed under this classification include repairs to the roof and skylights of the entire building, the adjustment of all elevators with the renewal of elevator cables where necessary, general repairs to plumbing and electric wiring, and attendance to 941 minor repairs in all portions of the building.

WORKS OF ART.

Accessions to the collection of works of art in the Capitol Building during the period covered by this report are as follows: Portrait of Hon. Swagar Sherley, by Charles Sword Williams; portrait of Hon. Claude Kitchin, by Freeman Thorp; portrait of President William McKinley, by Freeman Thorp; portrait of Hon. Justin S. Morrill, by Eastman Johnson; portrait bust of Vice President Thomas R. Marshall, by Moses A. Wainer; and portrait of President Abraham Lincoln, by Freeman Thorp.

Other works of art received prior to the fiscal year 1920, and subsequent to the publication of the Catalogue of Works of Art in the United States Capitol Building, not included in former reports, are portraits of Hon. James Latimer and Hon. Henry Latimer, by Clawson S. Hammitt; portrait of Hon. Shelby M. Cullom, by Auguste

Benziger; portrait of Hon. Oscar W. Underwood, by Michel Jacobs; portrait of Hon. Sereno E. Payne, by Cecilia Beaux; and portrait of Hon. John Langdon, by Hattie E. Burdette.

The portraits of President Lincoln, Senator Morrill, Hon. John Langdon, and the Latimer portraits are located in public corridors of the Senate wing of the Capitol Building; the other portraits are located in committee rooms of the Senate and House of Representatives.

CAPITOL GROUNDS.

All trees subject to attack by caterpillars, elm-leaf beetles, and other leaf-eating insects have been sprayed with arsenate of lead solution. New plantings for the year include 130 shrubs and 5 trees. Two trees have been removed, 6 treated for decayed cavities, and all necessary trimming attended to; 1,500 square yards of sod have been placed, and approximately 6 acres of lawn reseeded, and 14 plant cases pointed up.

CAPITOL POWER PLANT.

During the past year extensive repairs have been made to the waterways connecting the pumping station with the power plant. Incidental repairs and replacements of the mechanical and electric equipment have been attended to as necessary, and the efficient operation and service of the plant maintained. During this period the buildings used as dormitories on the grounds to the north of the Capitol, under the control of the United States Housing Corporation, have been supplied with electric current under the arrangement referred to in my annual report for the year 1919.

For the purposes of detailed information concerning the activities of the Capitol power plant it is stated that this plant furnishes heat, light, and power for the group of buildings containing the United States Capitol, the Library of Congress, the Senate and the House Office Buildings, furnishing heat for 45,613,550 cubic feet of space; current for 49,750 electric lights, 1,217 electric fans, and power for motors totaling 1,466 horsepower. The service of this plant furnishes current to 49 electric elevators and lifts within this group of buildings.

ENGINE HOUSE, SENATE AND HOUSE STABLES.

Necessary repairs have been made to the group of buildings combined under this appropriation, including repairs to roofs and gutters, repairs to plumbing and heating lines, rewiring and repairs to electrical apparatus, replacing of woodwork as needed, and such other repairs as have seemed necessary to preserve the buildings and render them suitable for efficient conditions.

COLUMBIA HOSPITAL FOR WOMEN AND LYING-IN ASYLUM.

In this building all classes of mechanical and electrical equipment have been overhauled and repaired, necessary adjustments of windows and doors attended to, and the lawns surrounding the hospital regraded, reseeded, and placed in a first-class condition.

COURTHOUSE, WASHINGTON, D. C.

Restoration and reconstruction of this historic building was completed in season for its occupancy by the courts of the District for the October sessions. Nearly three years were occupied in this work, the sessions of the courts in the meanwhile being held in temporary quarters leased for their use.

The entire cost of this work, including new furnishings, was \$852,000. Interesting public exercises commemorating the restoration of this building were held in the grounds adjoining the north side of the courthouse on October 27, 1919.

Respectfully submitted.

ELLIOTT WOODS,

Superintendent United States Capitol Building and Grounds.

The SECRETARY OF THE INTERIOR.

APPENDIX—EXPENDITURES.

Capitol Building and repairs, 1920.

Pay rolls and vouchers.....	\$23,948.34
Gasoline and supplies.....	1,059.60
Machinery and ironwork.....	1,548.26
Brushes, sponges, soap.....	893.34
Lumber and millwork.....	2,008.71
Hardware.....	1,094.96
Lime, brick, cement, sand.....	16.00
Paint, oil, glass.....	3,525.26
Stone and marblework.....	77.22
Legislative bell service.....	502.38
Drawings, blue prints, etc.....	13.68
Repairs to ranges, etc.....	131.20
Hauling, telegrams, exprees.....	35.19
Plumbing material.....	1,371.22
Elevators and repairs.....	1,155.37
Roofing and tin work.....	1,746.01
Painting and decorating.....	1,098.25
Tile and tiling.....	2,944.01
Flags.....	430.80
Traveling expenses.....	5.18
Stationery and books.....	172.94
Restoring walls, Senate.....	3,321.53
Heating and ventilating repairs.....	717.73
Fire protection.....	211.55
Acoustics, Supreme Court.....	9,985.00
Contingent expenses.....	25.00
Reserved for outstanding bills.....	9,461.27
Total.....	67,500.00

Amount appropriated sundry civil bill approved July 19, 1919.....	43,500.00
Amount appropriated deficiency bill approved Mar. 6, 1920.....	24,000.00

67,500.00

Improving Capitol Grounds, 1920.

Pay rolls and vouchers.....	\$27,749.12
Removing snow.....	934.09
Plants and seeds.....	260.00
Fertilizers.....	97.50
Tools and machinery.....	738.65
Brushes, brooms, etc.....	339.64
Motor and hand mowers.....	792.69
Plumbing materials.....	31.53

Paving and repairs.....	\$50.10
Freight and express.....	2.36
Hose and couplings.....	337.00
Lumber.....	374.06
Trucks, carts, etc.....	805.60
Trees.....	143.50
Travel expenses.....	59.75
Reserved for unpaid bills.....	2,854.41
Total.....	35,570.00

Appropriated sundry civil bill approved July 19, 1919..... 35,570.00

Capitol power plant, 1920.

Pay rolls and vouchers.....	\$87,416.32
Power-plant building.....	2,236.68
Miscellaneous power-plant equipment.....	1,688.65
Turbines and motor generators.....	348.37
Switchboards and equipment.....	44.90
Boilers and stokers.....	10,348.23
Coal and ash handling equipment.....	150.85
Miscellaneous steam equipment.....	2,103.56
Pumping station and waterways.....	5,178.75
Steam-transmission tunnel.....	108.07
Electric apparatus and accessories.....	322.21
Wire and material.....	7,806.91
Fixtures.....	668.50
Incandescent and arc lamps.....	12,147.72
Hauling, expressage, telegrams, etc.....	56.67
Gas and electric current.....	1,055.88
Fuel, oil, and waste.....	158,509.00
Traveling expenses.....	269.09
Reserved for unpaid bills.....	5,784.40

Total..... 296,244.76

Amount appropriated, sundry civil bill approved July 19, 1919..... 261,000.00

Amount appropriated, deficiency bill approved June 5, 1920..... 23,000.00

Credit for current furnished Housing Corporation..... 12,244.76

Total..... 296,244.76

Senate kitchen and restaurant, 1920.

Pay rolls and vouchers.....	\$36,213.17
Equipment.....	8,060.54
Repairs to ranges, etc.....	357.22
Cleaning materials.....	1,070.08
Food and supplies.....	10,357.55
Reserved for unpaid bills.....	1,932.39

Total..... 57,990.95

Amount appropriated, sundry civil bill approved July 19, 1919..... 41,000.00

Amount appropriated, deficiency bill approved May 22, 1920..... 16,990.95

Total..... 57,990.95

Engine house, Senate and House stables, 1920.

Pay rolls.....	\$844.30
Plumbing material.....	289.90
Lumber and millwork.....	166.55
Brick, sand, cement.....	4.95
Roofing and metal work.....	114.00
Hardware.....	43.65
Reserved for unpaid bills.....	36.65

Total..... 1,500.00

Amount appropriated, sundry civil bill approved July 19, 1919..... 1,500.00

Columbia Hospital for Women and Lying-in Asylum, 1920.

Pay rolls and vouchers.....	\$4,188.95
Repairs and material.....	3,766.12
Heat, light, and power.....	13,465.98
Reserved for unpaid bills.....	1,578.95
Total.....	23,000.00
Amount appropriated, sundry civil bill approved July 19, 1919.....	20,100.00
Amount appropriated, deficiency bill, approved Nov. 4, 1919.....	2,900.00
Total.....	23,000.00

RECONSTRUCTION OF COURTHOUSE, WASHINGTON, D. C.

Statement of appropriations, expenditures, etc., to June 30, 1920.

Appropriated:	
Sundry civil bill, approved July 1, 1916.....	\$200,000.00
Deficiency bill, approved Sept. 8, 1916.....	150,000.00
Deficiency bill, approved July 8, 1918.....	445,000.00
Deficiency bill, approved July 11, 1919.....	57,000.00
Total appropriation.....	852,000.00
Expenditures:	
Excavation.....	4,652.67
Concrete footings and foundations.....	12,452.00
Rough brickwork.....	79,599.33
Exterior stonework, stucco, main steps.....	114,362.30
Interior stonework.....	25,247.53
Steel framing for floors, roof, etc.....	29,401.95
Fireproof floor construction, concrete, etc.....	35,588.12
Terra-cotta partitions.....	5,126.21
Roof construction and skylights.....	22,708.95
Miscellaneous ironwork and stair construction.....	19,870.15
Elevators and inclosures.....	17,173.60
Steam heating.....	20,172.23
Plumbing, sewer work, standpipes, etc.....	34,255.85
Ventilation.....	7,586.88
Plastering and grounds.....	73,019.18
Ornamental plastering.....	928.50
Windows, doors, jambs, etc., millwork.....	104,016.25
Glass and glazing.....	6,172.20
Finished flooring—tile, terrazzo, cork.....	12,041.78
Electrical work and chandeliers.....	33,500.43
Painting.....	33,272.50
Furnishings, shades, awnings, etc.....	67,015.23
Architects and engineers.....	15,041.00
Drafting material and blueprints.....	1,280.82
Office force, foremen, constructors, timekeepers, watchmen, etc.....	22,743.55
Traveling expenses.....	416.61
Advertising and printing.....	93.47
Technical books and instruments.....	153.48
Telegraph, telephone, hauling, moving.....	7,104.73
Contingent, cleaning up, etc.....	4,223.10
Sheds, storehouse, tools, fence.....	325.64
Preliminary, wrecking, demolition.....	38,843.77
Reserved.....	3,509.99
Total expenditures.....	852,000.00

DEPARTMENT OF THE INTERIOR

REPORT
OF THE
DIRECTOR OF
THE NATIONAL PARK SERVICE

TO THE
SECRETARY OF THE INTERIOR

FOR THE
FISCAL YEAR ENDED JUNE 30, 1920
AND THE
TRAVEL SEASON 1920



WASHINGTON
GOVERNMENT PRINTING OFFICE
1920

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ANNUAL REPORT OF THE DIRECTOR OF THE NATIONAL PARK SERVICE.

DEPARTMENT OF THE INTERIOR,
NATIONAL PARK SERVICE,
Washington, D. C., October 14, 1920.

SIR: I take great pleasure in transmitting to you the fourth annual report of the National Park Service and feel confident that you will review the year's accomplishments with equal pleasure and satisfaction. The report covers the fiscal activities of the service to July 1, 1920, and the tourist season ending September 30; in short, what has been accomplished since my third report.

One outstanding feature of the year's achievements undoubtedly is the fact that, while trying economic conditions throughout the country, inflated valuations, increased prices of labor and materials have caused disturbances in every line of human activity and contributed to the general unrest of the masses, our people have turned to the national parks for health, happiness, and a saner view of life. Our final returns show that the volume of tourist travel to our national parks and monuments this year exceeded the million mark. The following table of travel during the past five years will furnish a very illuminating comparison:

	Number of people.
1916 -----	356, 097
1917 -----	488, 268
1918 -----	451, 691
1919 -----	811, 516
1920 -----	1, 058, 455

In the last analysis, this travel is the deciding factor as to whether or not the parks are measuring up to the high standard that has been set for them and all that is being said about them as the great recreational and pleasure grounds of the American people. Our travel figures indicate that our people have enthusiastically and spontaneously accepted these national wonderlands as their own. They are taking a personal interest in them. They are using them.

PARKS ARE TRULY NATIONAL.

Who will gainsay that the parks contain the highest potentialities of national pride, national contentment, and national health? A visit inspires love of country; begets contentment; engenders pride of possession; contains the antidote for national restlessness. It teaches love of nature, of the trees and flowers, the rippling brooks, the crystal lakes, the snow-clad mountain peaks, the wild life encountered everywhere amid native surroundings. He is a better

¹ Includes travel to 6 national monuments.

² Includes travel to 11 national monuments.

citizen with a keener appreciation of the privilege of living here who has toured the national parks.

The parks do not belong to one State or to one section. They have become democratized. The Yosemite, the Yellowstone, the Grand Canyon are national properties in which every citizen has a vested interest; they belong as much to the man of Massachusetts, of Michigan, of Florida, as they do to the people of California, of Wyoming, and of Arizona. There is not one of the major parks that has not been visited during the year by people from every State and Territory. And this emphasizes as nothing else does the keen foresight of those National Congresses that have, beginning with the creation of the Yellowstone National Park in 1872, continued the national policy of setting aside from time to time certain definite portions of the public domain containing natural exhibits of supreme scenic importance for all time for national-park purposes. Legislation during the year added one more park of great distinction to our proud national-park family.

ECONOMIC VALUE RECOGNIZED.

Stimulated by the whole-hearted, enthusiastic support of the press the impulse to See America first, and the national parks first of all becomes yearly more pronounced. Public organizations throughout the Nation have contributed their unstinted support to the movement. Throughout the East the great importance of keeping our travel money at home has been recognized. The concerted action of the large membership of the Far Western Travelers Association, with headquarters in New York City, for instance, in booming the national parks for the benefit of the entire West is a splendid example of patriotic public-spirited effort of commercial organizations.

Beyond the Mississippi the fact that the parks are the great lodestones of the West has been fully acknowledged. They attract visitors as do nothing else. People of all classes and means arrive. Every visitor is a potential settler, a possible investor. Above all, he is a satisfying source of business. Were each visitor to spend an average of \$100 on his tour, and this figure I feel confident is considerably below the average, it means \$100,000,000 left on these park trips alone—not within the parks solely but along the whole route of travel; left in this country for the development of our industries and resources rather than to accrue to the benefit of foreign countries.

CIVIC PRIDE ENGENDERED.

Gov. Olcott, of Oregon, recently strikingly pointed out the civic pride of our Western States in the great scenic attractions within their borders, when he said:

The public at large in this State, and thousands of tourists, I am certain will deeply appreciate the preservation of our natural wonders as far as may be done. I would not for a moment interfere with the legitimate progress of industry, but I believe our industries may thrive without sacrificing the beauties that the Creator has given us.

When the opportunity was presented to the cities of California during the past year to join in the formation of operating companies to develop hotel, camping, and transportation facilities in the Yo-

semite and Sequoia Parks, the whole-hearted unselfish support this movement received foreshadowed its early success. Harry Chandler, the editor of the Los Angeles Times, himself a heavy investor to these enterprises, expressed himself as follows:

All of us were very much impressed with the necessity and desirability of the company going ahead with development just as fast as we can raise the money to do so. I was very much gratified that all those that I had induced to invest in the enterprise were pleased and enthusiastic over it. The most of them do not feel so sanguine that it will ever develop into a money-making enterprise, but they do feel that their investment is more than justified from a civic standpoint. When they were invited to make the investment nothing more than a hope was expressed that it would be successful from a financial standpoint, but it was urged, in the strongest possible way, that every citizen of California who had a stake in the State, that he had made through his business operations in the State, owed at least a moral obligation to help develop one of the State's natural attractions that should be the pride of every citizen of the State and the Nation, to wit, the Yosemite National Park. And it is on this account that citizens of California owe something to the State while they are alive, and that the need of accommodations, not only through the park but through the whole Sierra Nevada country, is a call upon them that they can not resist to maintain themselves in good standing among their fellows.

His expressions were typical of the great public spirit of the various communities that contributed to these funds.

AN ANALYSIS OF THE PARK TRAVEL.

Final travel figures, reaching a total of 1,058,455 visitors, show a healthy and substantial growth of American tourist travel in America. This travel has now reached a proportion where it must be seriously considered as an economic factor in our national life. Surely travel of this proportion is not born of merely a restlessness on the part of our fellow citizens to be going somewhere just for the going, but denotes a deeper feeling, pride of country, a desire to see and know their land and to make that use of their national parks for which these playgrounds were created. In no sense can we view this travel as abnormal, merely the peak year in American travel for which there was no other outlet.

Let us analyze our travel figures. They represent a travel of 919,504 tourists to 17 national parks and a travel of 138,951 tourists to 11 national monuments. No records are available for the Hawaii National Park, in Hawaiian Islands, or for Mount McKinley National Park, in Alaska, or for the remaining 13 national monuments under our administration.

In 1917 travel to 14 national parks totaled 488,268 visitors, which was an increase of over 100,000 visitors for the best previous travel year. In 1918, the war year, 451,661 visitors were recorded in the same national parks. In 1919 two additional national parks were created, and travel for that year increased to 755,325 visitors, or 67 per cent over the war-year record. Also in 1919, 56,191 visitors were recorded in 6 national monuments, making a total travel for 1919 of 811,516. Expressing this astonishing growth of tourist travel in terms of percentage, travel in 1920 increased 117 per cent over 1917, 134 per cent over 1918, and 30 per cent over travel for 1919.

Let us consider the increase in motor travel to the national parks. In 1917, 54,692 private cars were recorded; in 1918, 53,966; in 1919, 97,721; and this year the total number of cars entering the national

parks is 128,074. These figures show an astounding increase in motor travel to the national parks. Train travel has increased on the average in about the same ratio.

It is difficult to determine the proportion of visitors who come by private automobiles and who come by train. Exact data on this distribution are kept in several of the parks, but in certain parks which are accessible to large centers of population and reached only by motor highway it is impossible to make this segregation. In Yellowstone National Park, which is reached by three large railroad systems, a very accurate record is kept of each class of travel, and the following table shows this distribution.

Year.	Number of motorists.	Train tourists.	Total.
1917.....	22, 117	13, 283	35, 400
1918.....	18, 249	3, 026	21, 275
1919.....	40, 986	21, 275	62, 261
1920.....	49, 491	30, 286	79, 777

These statistics show that tourists coming by private automobile represent on the average 65 per cent of the park travel. This percentage probably will hold true for all the parks.

TRAVELERS COME FROM EVERY STATE.

Just as the rail lines brought people to the parks from every State in the Union and from many foreign countries, so were motorists recorded traveling in private cars from every State and from Canada and Mexico. Some motorists visited all the national parks, and many others toured from two to four or five. More than half of these carried their own supplies and camp equipment and enjoyed their playgrounds in their own way.

MOTOR TRAVEL INCREASED DESPITE GASOLINE SHORTAGE.

While motor travel to the parks increased tremendously over the high-water mark of 1919, the serious shortage of gasoline in the Pacific Coast States and the consequent restrictions placed upon its sale undoubtedly made itself felt in park travel. The filling stations in the parks, however, were kept well supplied, and motorists had no difficulty in obtaining necessary fuel for return trips. In like manner, excessive rains throughout the Central West early in the season adversely affected motor travel. There is no doubt that had normal conditions prevailed throughout the season thousands more motorists would have made the park trips.

TRAVEL HANDLED BETTER.

Last year considerable congestion was caused at times in a number of the parks by the holding of large conventions at the height of the tourist season. By carefully planning reservations in advance this difficulty was avoided this year and but few complaints were observed. Extension of hotel and camp facilities contributed toward this relief. I am heartily in favor of the utilization of our parks for convention purposes, and wish to encourage this practice in every way

possible, but not to the detriment of the individual tourist, who must first be accommodated.

Later in the season the demands for accommodations in the parks became so heavy that many of the touring agencies discouraged the booking of large party trips, particularly to the Rocky Mountain and Yellowstone Parks.

INCREASED ACCOMMODATIONS PLANNED.

The extensive hotel and camp developments planned for the immediate future undoubtedly will enable our operators to accommodate every comer without inconvenience to anyone. In Mount Rainier National Park the Paradise Inn is being enlarged at this moment for next season's travel; in the Yellowstone, extension of the public camps is being pushed to rapid completion and public camp grounds are being expanded; in the Yosemite, the new hotel and camp-improvement plans contemplate the expenditure of over a million dollars; in the Grand Canyon, expansion of the camping system on the floor of the canyon will shortly be undertaken; in Rocky Mountain National Park, the camp improvements in the Grand Lake section on the western side of the park have anticipated the opening of the Fall River Road, and public camp grounds are being planned on a more extensive scale. It must be remembered that in the northernmost parks, as Glacier, Yellowstone, Yosemite, and Mount Rainier, the working season is short, and runs with the tourist season. It is not possible to do much construction work after the snow begins to fall, and it falls early and stays late. Construction work must be done during the summer season, which places a double burden on the public operators.

INSPECTION TRIP OF COMMITTEE ON APPROPRIATIONS, HOUSE OF REPRESENTATIVES.

Of great importance to the development of our parks was the visit of members of the Committee on Appropriations of the House of Representatives to some of the northern parks during June, July, and August of this year. With the exception of one member, none of the present committee had had the opportunity to visit our national playgrounds for which they were annually asked to appropriate Federal funds. At the suggestion of Chairman James W. Good, the committee decided that it was in the interests of the Government for them to obtain first-hand information on as many of the national parks as possible as could best be combined with an inspection of various reclamation projects within the scope of a tour of reasonable length.

All arrangements for the inspection trip were left in the hands of the Park Service and the Reclamation Service. While funds were available to defray the expense of the inspection of the reclamation projects, none was available for defraying expenses of the national-park inspections, and, with the customary generosity, the western cities to be visited in connection with the national-park trips provided these necessary funds; within the parks the authorized public operators took care of the party. It is with the deepest appreciation of the many courtesies that I desire to thank these public-spirited organizations for contributing to the success of the trip.

SIX PARKS VISITED.

The party started from Chicago on June 20, the trip taking 42 days. Rocky Mountain, Yosemite, Crater Lake, Mount Rainier, Yellowstone, and Glacier National Parks were visited in the order named. Chairman Good also visited the Sequoia National Park, while the main party was in the Yosemite. Officials of the various railroads which handled the congressional party accompanied them over their respective lines. The many courtesies extended by these officers and the efficient manner in which they handled the entire trip were some of the outstanding features of the tour.

Eleven reclamation projects were inspected, as were a number of private irrigation projects and proposed projects which will later be presented to Congress. In all, the party traveled 7,000 miles by train and boat, and about 2,500 by automobile.

PERSONNEL OF THE PARTY.

The personnel of the party who made the entire trip, or who joined for several of the park and reclamation project visits, were Representatives James W. Good, Iowa, chairman; William R. Wood, of Indiana; Louis C. Crampton, of Michigan; Burton W. French, of Idaho; Milton W. Shreve, of Pennsylvania; Joseph W. Byrns, of Tennessee; James F. Byrnes, of South Carolina; John M. Evans, of Montana; John J. Eagan, of New Jersey; James A. Gallivan, of Massachusetts; and Nicholas J. Sinnott, of Oregon, chairman of the Committee on Public Lands of the House of Representatives. The following officers of the Reclamation Service accompanied the party: Mr. Arthur P. Davis, Director; Mr. F. E. Weymouth, Chief engineer; and Mr. J. B. Beadle, assistant to the director. I was unable to accompany the party at the start, so my assistant, Arno B. Cammerer, had the party in charge for the Rocky Mountain Park visit. I joined the party en route at Cheyenne and remained with them until after the Mount Rainier visit. Horace M. Albright, superintendent of Yellowstone National Park, and George E. Goodwin, acting superintendent of Glacier National Park, had charge of the party in their respective parks.

PARKS AND ADMINISTRATION COMMENDED.

During the park visits our superintendents had the opportunity of explaining in detail to the members many of their problems of administration and the necessity for further park improvements, and personal inspection of many of these features was accomplished. The entire trip was handled with thoroughness and dispatch and all arrangements were carried out in excellent order. That our national parks and the men who are so faithfully administering them made the highest impression on the committee is certain.

I have been particularly gratified in receiving a letter from Chairman Good upon his return home, from which the following is quoted:

The committee has had a wonderful trip. * * * I was prepared in some degree for the grandeur of the scenery and the many wonderful attractions which the parks afford, but I was not prepared for the splendid service which is afforded persons who are permitted to visit the parks. I can not too strongly commend your entire plan.

If I were to offer any suggestions at all to make the parks more popular, they would be few, indeed. I am inclined to think that a little more provision should be made for the auto tourists in the parks by providing some community center where they could assemble during inclement weather and where a better opportunity for tourists from various parts of the country could come together and fraternize. But this is of minor importance.

I am strongly impressed with your entire organization and with the high character of the men whom you have brought into the service, not only as superintendents but as rangers. I did not realize before the high character of the men whom you had employed to perform these services. Certainly they are not attracted by the salaries received. So, too, the concessionaires of the parks seemed to be actuated not so much by the profits that may be realized from the parks. Considering the fact that the parks are open during a very small portion of the year and that efficiency in any service can only be obtained by continuous work in building up an organization and weeding out the undesirable, I am very greatly pleased with the entire park service. You certainly are to be congratulated upon a very great accomplishment with respect to the entire park management.

REPRESENTATIVE HICKS ALSO STUDIES PARK ADMINISTRATION.

Among other distinguished legislators who visited one or more of the national parks during the year, Representative Frederick C. Hicks, of Long Island, N. Y., made an extended tour of the Rocky Mountain, Yellowstone, Glacier, Crater Lake, and Mount Rainier National Parks. He spent considerable time in each of these parks and carefully observed our administration of each. Upon his return he was kind enough to give me the results of his studies, and he outlined a number of excellent suggestions for improvement of the facilities offered the traveling public and for the betterment of conditions in general. These suggestions have proved exceedingly helpful. Mr. Hicks was particularly impressed with the type of the men who are administering the parks, characterizing them as "men of superior type and of the highest integrity, imbued with the true spirit of the park service, and responsive to the positions as custodians of the public domain."

VISIT OF THE BELGIAN ROYAL PARTY.

Among the most distinguished visitors to the national parks this past year were the King and the Queen of the Belgians, who, with the Crown Prince, visited Yosemite and the Grand Canyon National Parks in October, 1919. The royal party consisted of about 60 people, including, besides Their Majesties and the Crown Prince, the Count D'Oultremont, adjutant of the court; Baron de Cartier de Marchienne, Belgian ambassador to the United States; the Countess Chislaine de Charaman-Chimay, lady in waiting to Her Majesty; Lieut. Gen. Baron Jacques, commander of the Third Division; Lieut. of Cavalry Goffinet, officer of ordnance to His Majesty; Lieut. Col. Nolf, physician to Their Majesties; Max Leo Gerard, secretary to His Majesty; Charles Craux, secretary to Her Majesty; and the American representatives, consisting of Brand Whitlock, American ambassador to Belgium, and Mrs. Whitlock; Maj. Gen. William M. Wright; Rear Admiral Andrew T. Long; Col. Patterson, aid to Gen. Wright; and Jefferson Gaffery, secretary of the American embassy. The royal party was in charge of Mr. J. B. Nye, chief of special agents of the Department of State.

The party spent two days in the Yosemite, visiting, among the points of interest, the Valley, the Mariposa Grove of Big Trees, and Glacier Point. At the latter place the hotel had been closed for the season, but was opened especially to accommodate the royal party, and great credit is due the Yosemite National Park Co. for the manner in which they cooperated to make the stay of the royal visitors a great success. Particular credit is due Supt. Lewis and his men for the efficient manner in which this large party was handled. It should be remembered that 12 automobiles were used, traveling continuously a distance of from 1,800 to 2,000 miles without a mishap or a moment's delay for repairs.

Only one day was spent at the Grand Canyon, the party arriving the morning of October 18 and departing the same evening. Gov. Thomas Campbell, of Arizona, welcomed Their Majesties to the Grand Canyon on behalf of the State. Great credit is due the Fred Harvey Co. for the efficient cooperation given our superintendent in the entertainment of these distinguished visitors. So successful were the efforts of the park officers to make the visit of their guests a pleasant one that, upon leaving, the King bestowed signal honors on the acting superintendent, Peters, and each one of the rangers.

The ease and dispatch with which this large party was handled in both the Yosemite and the Grand Canyon attests to the efficiency of our park organizations at those places.

ESCORTED NATIONAL-PARK TOURS.

I called attention last year to the number of large escorted parties touring the national parks as an unusual feature of the season's travel. This year I would refer to these escorted tours as the feature of the season's travel. Escorted tours are proving very popular; all the large tourist agencies offered escorted national-park tours; the railroads entered the field; and many organizations conducted them for their members.

BROOKLYN DAILY EAGLE TOUR.

The Brooklyn Daily Eagle newspaper again organized a national-park tour, this time to participate in the dedication of the Grand Canyon National Park. Besides Grand Canyon, the Yosemite National Park, and Casa Grande, Muir Woods, and Petrified Forest National Monuments were visited. A gift from the members of funds to build an information building at Grand Canyon is mentioned elsewhere.

BUREAU OF SERVICE NATIONAL PARKS AND RESORTS.

On March 1, 1920, the Chicago & North Western Railway and Union Pacific System established the Bureau of Service National Parks and Resorts under the same management and to do work similar to that of the Bureau of Service National Parks and Monuments maintained by the United States Railroad Administration. The Bureau of Service National Parks and Resorts has offices in Chicago, Ill., and a staff of traveling representatives. Complete information regarding accommodations, cost, and how to reach the national parks is furnished by the bureau, without charge, to all applicants. Twenty Yellowstone-Rocky Mountain National Park tours were run and

1,750 passengers were handled. The bureau reported that 2,500 passengers could have been handled if sufficient stage and hotel accommodations had been available.

ORGANIZATIONS HAVE TOURS FOR MEMBERS.

The Travel Club of America and the Massachusetts Forestry Association conducted grand circle tours of the national parks, the former from New York City and the latter from Boston. Rocky Mountain, Yellowstone, Glacier, Mount Rainier, Crater Lake, Yosemite, and Grand Canyon National Parks were visited. The Massachusetts Forestry Association also included Sequoia National Park in its itinerary.

OTHER TOURIST AGENCIES.

Thomas Cook & Sons, Frank Tourist Co., Raymond & Whitcomb, and the American Railway Express, among the larger tourist agencies, reported exceptional seasons for escorted national-park tours. These agencies also maintain offices in Europe, and this year have given attention to the promotion of tourist travel from Europe to America and our national parks.

A CRISIS IN NATIONAL CONSERVATION.

But it is at this time, when the national parks are entering upon their period of greatest usefulness, that they are confronted with dangers that threaten their very existence. The most determined efforts are being made, and will continue to be made, by private irrigation and water-power interests to invade the sanctity of these great areas reserved from the national domain solely because of their matchless scenic exhibits. It is primarily toward the utilization of their wonderful lakes, rivers, and spectacular waterfalls that their efforts are directed, and we are squarely face to face with the fact that the whole National Park System is facing a grave crisis, where a single false step would be irremediable.

Prior to the passage of the Federal water-power act, to which I will advert later on, these efforts during the year were all directed toward utilization for irrigation purposes of areas within the Yellowstone National Park, the first national park to be created, and in whose organic act a far-sighted Congress stipulated that it should be set aside for all time in its natural condition as a public park and pleasure ground for the benefit and enjoyment of the American people.

NOT THE FIRST ATTACKS.

These are not the first attacks directed against the national parks. Forty years ago strenuous efforts were made by private capital to construct a railroad through the northeastern part of Yellowstone Park to Cooke City, but ever-alert friends of the parks have been successful in frustrating all of these attempts. In 1913 the utilization of the Hetch Hetchy Valley in the Yosemite to form the source of the water supply for the city of San Francisco received the sanction of Congress. The first indication of definite plans to utilize the lakes of the Yellowstone for irrigation purposes appeared in July,

1919, when representatives of Idaho irrigation interests appeared before the Secretary of the Interior and requested a permit for a survey to determine the possibilities of the Yellowstone Lake waters for irrigation purposes. The Secretary made it clear to the delegation at the time that the department had no authority under the laws to grant permanent irrigation easements in any national park for private purposes; but he granted the permit for a reconnaissance survey in order to ascertain the extent to which their plans were laid. I am glad that this permit was granted, because the results of the survey revealed this extent, and the damage that would occur to the lakes and other water exhibits of the park. This particular project has been called the Bruneau project, and, aside from the so-called Falls River project fostered by the Fremont-Madison Reservoir Co., of Idaho, which was covered in H. R. 12466, and which I will discuss extensively later on, is the only one which has been officially considered in any detail by the Department of the Interior.

I will briefly review these projects to indicate their scope and the great damage any one of them would do to the park were they to be permitted.

BRUNEAU PROJECT.

The Bruneau project contemplated the utilization of waters of Yellowstone Lake, Shoshone Lake, Lewis Lake, and Heart Lake, and the flooding of the Falls River Basin in the southwestern part of the park. It has been learned from promoters of the project that they want to place a dam at the outlet of Yellowstone Lake, approximately on the site of the present fishing bridge near the point where the Cody Road joins the main loop-road system of the park. This dam would be equipped with floodgates, which, it is stated, would serve to regulate the flow of the water in the Yellowstone River, and that they would actually be so regulated as to keep the flow of the river normal, thus not impairing the falls in any degree. The dam would also be used as a bridge, the old bridge being torn down.

It was believed by the promoters that the water in Yellowstone Lake could be raised during the winter to the usual high-water level and drawn off in the early spring and stored in a large reservoir to be erected near American Falls, Idaho, and again filled from the flood waters of the spring and drawn off during the irrigation season until the low-water mark was reached. It was proposed to draw off these flood waters through two tunnels to be constructed through the Continental Divide, one from the Flat Mountain Arm of Yellowstone Lake through the Continental Divide to Beaver Creek, a large tributary of Heart Lake, and the other from South Arm through the Continental Divide to Outlet Creek, a large tributary of Heart River. Later I learned that it is proposed to construct only one tunnel from Flat Mountain Arm to Beaver Creek, the other tunnel project having been abandoned.

The construction of the tunnel would undoubtedly seriously injure the scenic beauty of the Flat Mountain Arm of the lake, but the most serious damage would be caused to Heart Lake. Our engineer's preliminary reconnaissance showed that if the lake was raised to its high-water level its area would be increased about 900 acres. The capacity of the reservoir established would be 439,500 acre-feet. This would increase the stream flow of the Snake River about 150

second-feet if storage was utilized throughout the year, or about 600 second-feet during an irrigation season of three months. However, it is not proposed to carry this water off during the year, or even during an irrigation season of three months. It is proposed to carry off the winter storage water in a very short period of time, which would increase the flow of water in the Snake River from 1,000 to 1,500 second-feet.

BEAUTIFUL HEART LAKE WOULD BE RUINED.

This would play havoc with Heart Lake and make it simply a dumping hole for water from Yellowstone Lake preparatory to flowing into the Snake River. Furthermore, it would throw such a volume of water into the Snake River that it would tear its banks over a distance of 20 miles, uprooting trees and creating a scene of havoc that would be awful to contemplate. The enormous hot springs below the junction of Heart River with the Snake River would be greatly damaged. I have not been able to ascertain how much of the Heart Lake geyser basin would be affected by the diversion from Yellowstone Lake, but it is likely that part of this basin, including the very remarkable Rustic Geyser, would be injured.

Heart Lake is one of the most beautiful lakes of the park. It is mentioned in all of the earlier reports, and its geyser basin was seen and commented upon by the discoverers of the park. Henry Gannett, in the 1878 Hayden Report on the Geological and Geographical Survey of the Territories of Wyoming and Idaho, makes the following statement about it:

Heart Lake, the head of one of the principal branches of the Snake, is a beautiful little gem lying amid dense forests at the eastern base of Mount Sheridan, the highest peak of the Red Mountains. It is about 3 miles long by $1\frac{1}{2}$ miles wide. It covers 3 square miles and is of very irregular shape, the resemblance in form to a heart being very slight.

Mount Sheridan rises majestically above the lake and the Red Mountains, the picturesque group mentioned in the above quotation, make the scenery between Heart and Lewis Lakes exceedingly worth while.

LEWIS AND SHOSHONE LAKES IN DANGER.

Much more serious, however, would be the damage to Lewis Lake should the Bruneau project be sanctioned. It is proposed to place a dam at the outlet of Lewis Lake which would raise the water to the level of Shoshone Lake. While I have not been able to have a survey made to determine how much land would be flooded by this enlargement of Lewis Lake, anyone who has studied or observed the topography of the country can readily see that it will flood thousands of acres of land, and will destroy a considerable mileage of the road to the south boundary. It will also flood the Lewis Lake hot springs basin near the northeast corner of the lake. The destruction of the timber that this flooding would cause, however, would be the worst thing that would happen to this beautiful body of water. This lake is now well stocked with fish and has great possibilities as a tourist resort. Any flooding of this lake, however, will give it the same appearance as Jackson Lake. Dead trees everywhere about its boundaries will pollute the water and kill the fish.

Furthermore, once having received the privilege of damming Lewis Lake, the precedent would be established for enlarging the dam and further increasing the storage until it covered many thousands of acres of the lowlands south and east of the lake. It would also constitute a precedent for flooding Shoshone Lake sooner or later, because both lakes have relatively the same value from the scenic standpoint. If it is all right to flood and ruin Lewis Lake, it is likewise proper to raise Shoshone Lake.

FALLS RIVER BASIN ALSO.

The fourth feature of the Bruneau project is the utilization of the so-called Falls River Basin in the southwest corner of the park. It was proposed to build a dam or dams in such a way that both the Bechler River and the Falls River valleys would be flooded for storage purposes. This would submerge approximately between 20,000 and 30,000 acres of meadow and swamp lands which are the all-year-round habitat of perhaps our biggest moose herd. Rangers who know this district claim that more than 500 moose range in this territory throughout the year. There is also a fine band of elk in this section, although the elk do not stay in the basin all winter. It should also be observed that in this basin is a very interesting growth of the larger coniferæ, spruce and pine being the predominating species.

This region, while not yet visited by many tourists, has always been regarded as one of the most interesting and important parts of the park, and will some day be developed properly. Henry Gannett, who was in charge of the topographical survey of the region in 1878, said:

It is one of the few remaining haunts of the moose in the Northwest.

It is important to observe here that if this region was one of the few remaining haunts of the moose in the Northwest in 1878, its preservation must be very much more important at the present time, and this is certainly the fact.

NOT A WORTHLESS SWAMP AREA.

I quote from the 1878 Hayden report of Henry Gannett's statement regarding the Falls River. It is from the many falls on this beautiful stream that it took its name.

This stream heads in the southern slopes of the great plateau which Bechlers Fork traverses, rising in four large springs, which give birth immediately to a good-sized river. Its course is nearly due west, skirting the southern base of this plateau. The divide between this stream and the Snake is very gentle, being, indeed, almost imperceptible. Its course from the divide to the lakes Beulah and Hering is very quiet, with a gentle current through grassy meadows, but from the point of its emergence from the former of these lakes it becomes a brawling, turbulent stream, broken by cataracts and falls, from which it has received its name. These falls, which succeed one another at short intervals, have heights, respectively, of 12, 6, 12, 40, 20, and 30 feet. Finally, at a point but 3 or 4 miles above where the stream debouches into Falls River Basin occur the Great Falls. These, which are close together, consist of two, each having a clear leap of over 20 feet, closely followed by a third of 47 feet, below which are two smaller ones. The total descent is 140 feet, my measurements agreeing very closely with those of Prof. Bradley.

Yet this Falls River section has been described as a worthless swamp of no value for any purpose but the storage of water. Supt. A. H. Dinsmore, of the United States Bureau of Fisheries, who visited that section during the summer, writes about it as follows:

We found one of the most beautiful, if not the most beautiful, valleys in all the park—flat as a floor, abounding in wild and domesticated grasses, and meandered by fine, clear streams in which native trout of large size may be taken in large numbers.

At the head of the valley, within an area of not more than 3 miles, not less than eight streams fall from the timbered plateau, over falls and cascades which rival any in the park save the Great Falls of the Yellowstone. So close to the valley are these waterfalls that many of them are in plain view as one rides through it.

The Falls River part of the project is not directly connected with the Bruneau plan. It seems that the people in the Twin Falls district, Idaho, are to make some trade of irrigation rights whereby the people about Idaho Falls, St. Anthony, Sugar City, and other communities in that neighborhood are to receive water from the Falls River Basin in return for certain rights on the main Snake and on the North Fork of the Snake.

I have no data available at this time regarding the exact amount of land that would be flooded in the Falls River Basin, although I have stated this to be between 20,000 and 30,000 acres. However, all of the lowlands from the south and west boundaries of the park to the cliffs below the Madison and Pitchstone Plateaus would be turned into a vast lake in which several thousand acres of timber would be killed, besides destroying the grazing lands of the moose and elk.

THE DUBOIS PROJECT.

The so-called Dubois project contemplates the utilization of the Falls River Basin and the Shoshone and Lewis Lakes for the irrigation of arid lands in Idaho between Aberdeen and Dubois, on the west side of the Snake River. It has not been ascertained whether the waters of Yellowstone Lake are involved in this project, and, in fact, I have very little information concerning this development. The fact that this project is being prepared for submission to Congress shows that the Bruneau project would not stop with the raising of waters in Lewis Lake.

THE CARLISLE PROJECT.

Another project, developed in Cheyenne, Wyo., the so-called Carlisle project, contemplates the placing of a dam at the outlet of Yellowstone Lake, which would raise the normal level of the lake approximately 29 feet, the idea being to take the water stored by this dam in tunnels into the Snake River watershed in much the same way that the Bruneau project proposes taking the waters from Yellowstone Lake.

In order to ascertain what damage would be done to Yellowstone Lake if such a project as this one would go through, I had a reconnaissance survey of the lake made, in the late summer of 1919, which included the 25-foot contour line about the normal elevation of 7,741 feet above sea level, which is the normal water elevation of the lake as given by the United States Geological Survey maps. Owing to

the dryness of the season, the lake was, from reliable accounts, lower by about 22 inches than had been observed since 1901. For the purposes of the survey it was assumed that the normal water elevation of the lake was 7,739.5 feet above sea level, or 18 inches below normal. The 25-foot contour was therefore taken to be 26.5 feet above the present water elevation. A temporary gauge established at the pier of the Bureau of Fisheries indicated that there was but small variation in the lake elevation during the period in which the work was performed.

DAMAGE DONE IF LAKE RAISED 25 FEET.

Assuming that the lake was to be raised 25 feet above the normal lake elevation, the area submerged would be 9,000 acres. Since but 100 miles of the lake shore (from Rock Point to Delusion Lake outlet) were traversed out of a total of 136 miles of shore line, the above amount was derived by computation and estimate. These show that 8,350 acres would be submerged in the 100 miles traversed and that 650 acres would probably be submerged in the remaining 36 miles. From a knowledge of the ground, it was assumed in the estimate that the 25-foot contour would be an average distance of 150 feet from the lake shore at the present elevation of the lake.

Of the 8,350 acres that were determined would be submerged, 4,000 acres are timberland, 3,400 acres are meadowland, 900 acres constitute the present beach, 35 acres are burnt area, and 15 acres are now occupied by small lakes. By far the greater portion of the 8,350 acres lies in the Pelican Valley and the upper Yellowstone Valley. Furthermore, 17,350 feet, or about $3\frac{1}{4}$ miles, of the present road system would be submerged. This does not include the road at the Thumb, which under those conditions is liable to be inundated.

GAME FEEDING GROUNDS WOULD BE DESTROYED.

Several thousand acres of the finest feeding grounds for elk, deer, and other game would be made worthless, and it is estimated that lodgepole pine and spruce averaging between 4,000 and 5,000 board feet per acre, or about 18,000,000 board feet total, would be destroyed. The southern extremities of the Southwestern Arm, the South Arm, and the Flat Mountain Arm have been filled by huge deposits of mud, forming flats which during low water are covered with a fine growth of vegetation. These flats are the feeding grounds of innumerable fowl—geese, ducks, mud hens, swans, and other bird life. Also they appear to form a desirable rendezvous for moose. Although no moose were seen during the reconnaissance in the Southeast Arm, there were sufficient signs to show that they were plentiful. On the mud flats in South Arm and in Flat Mountain Arm several bull moose and cows were observed. Should the lake level be thus raised, both game and fowl would be forced to find new feeding grounds. The picturesque islands—Dot Island, Peale Island, and Stevenson Island—all would be obliterated. Furthermore, the numerous hot springs at Steamboat Point, Butte Springs, and possibly many at the Thumb, including the famous Fishing Cone, would be destroyed.

EVEN FIVE-FOOT RAISE WOULD BE DESTRUCTIVE.

From what information I was able to gather from the engineer making the survey for the power and irrigation companies interested in the project of utilizing the Yellowstone Lake as a storage reservoir, I learned that possibly a raise in the lake elevation of but 5 feet above normal might be contemplated. The lake has a superficial area of 87,000 acres at normal elevation taken from the topographic map surveyed by the United States Geological Survey. Were the lake to be raised this figure, the present beach would be submerged and also a considerable portion of the present road system at Bridge Bay and Pelican Creek. This, however, would be under normal conditions. But the lake has a change of stage of about 6 feet, as recorded by the then low water and by high water recorded at the fish hatcheries in 1918. During high water, therefore, the country surrounding the lake would be submerged to an additional $4\frac{1}{2}$ feet. What additional land would thus be submerged I am not prepared at this time, without detailed investigation, to say: undoubtedly lands in Pelican Valley and in the upper Yellowstone Valley would be affected. The fact remains indubitable and incontrovertible that the natural scenic beauty would be affected, and, once a low dam is in, a 10-foot dam or a 25-foot dam would be the natural consequence. The precedent simply must not be established.

Lack of funds and engineering assistance prevented me from having similar brief surveys made of Heart, Lewis, and Shoshone Lakes and of the Falls River Basin, where the same data could have been secured regarding the timber that would be destroyed and the areas that would be submerged by the construction of dams, as I secured by the reconnaissance survey of Yellowstone Lake. And it must be remembered, and I wish to emphasize this, that the Yellowstone survey was a brief reconnaissance and not a detailed survey, and that only the latter would produce such accurate figures and other desirable information as would not be open to question.

FALLS RIVER BASIN PROJECT.

But the situation during the year that was fraught with the greatest danger to the park was the effort made by the Fremont-Madison Reservoir Co., of Idaho, to secure congressional sanction for a right of way for irrigation reservoir purposes in the so-called Falls River Basin in the southwestern part of Yellowstone National Park, utilizing the watershed of the Falls River and Bechler River basins. This project was similar to the fourth feature of the Bruneau project, already adverted to on pages 22-25, where I described in detail some of the natural characteristics of the basin.

The project was first broached to me by the Commission of Reclamation of Idaho and other representatives of interested irrigation interests of that State in personal conference. It was urged that the southwestern part of Yellowstone Park was an entirely unused part of the park and that the establishment of the necessary reservoirs there, under their propositions, would not conflict or interfere in any way with the utilization of that area for park purposes. I was urged to give my approval. I had never visited that section of the park and

was entirely unprepared to discuss the proposition. I stated that the mere fact that a section of a park was not utilized for park purposes at this time would not mean that it would not be an extremely desirable and popular part of the park 20 or 50 years hence. I expressed myself as unequivocally opposed to the introduction of any such projects into the park area, as that would be absolutely contrary to the primary purposes for which any national park was established.

It did occur to me, however, that if Congress should decide to consider the possibilities of this project it would be essential that an investigation of the area be made in order that I might be prepared with my recommendations, perhaps to the extent that that portion of the park be excised if the reservoirs should go in. It was definitely understood and agreed that no legislation was to be pressed until I had had this opportunity to investigate, and members of the delegation promised to accompany me on this inspection trip.

AGREEMENT TO INVESTIGATE VIOLATED.

Disregarding this agreement and without waiting for such an investigation to be made, the department was again approached with the same proposal. I made an emphatic protest (see p. 414) against favorable consideration. I felt that I would be violating the obligations imposed upon me as the Director of the National Park Service, which are so to administer Yellowstone National Park that it will be preserved in its natural state, unimpaired for future generations, unless direct prior action by Congress would compel me to modify my stand in any one particular. However, the department felt that it was solely for Congress to say whether such an easement should or should not be granted, and a draft of a bill was suggested and prepared by the department which in terms authorized the Secretary of the Interior to grant the easement if, after investigation and in his judgment, such grant may be made without detriment to or interference with the occupation and use of the land by the United States for park purposes. It was felt that this form would satisfactorily protect the interests of the United States in case congressional approval was given. Assurances were given that the use of only the Falls River Basin was contemplated.

The form of the bill is the same as H. R. 12466, as it was reported out of the House Committee on the Public Lands, without amendments, and which is printed on page 386.

BILL PASSES SENATE.

The amended portions are underlined and were made by the House Committee on Public Lands. The bill passed the Senate on April 6, 1920, and was reported out by the House Committee on the Public Lands, with amendments, on March 25, 1920. In the hearings before the House committee I did not object to the form of the bill, believing the interests of the United States under the circumstances sufficiently safeguarded.

By this time the proposed legislation had come to the attention of many public organizations interested in the national parks, and a storm of protests arose.

BLOCKED IN HOUSE.

The bill had been placed on the unanimous-consent calendar, but objections had blocked its passage. Efforts were made by a special rule to secure consideration of the measure on the general calendar. The requests by these public organizations for a hearing before a special rule would be granted were, however, so insistent that the chairman of the Committee on Rules held an open hearing at the Capitol on May 25, 1920, on the merits of the measure. You yourself wrote the chairman of this committee and also the floor leader of the House that the bill should not pass.

PRECEDENT WOULD BE ESTABLISHED.

Prior to this my attention had been called to a letter written by the commissioner of reclamation of Idaho to the Secretary of Agriculture, dated February 21, 1920, in which he, referring to this project, said:

It does not cover any possible use of Yellowstone Lake, but, of course, if favorable action is taken on the bill, a precedent will have been established which later should result in such use of Yellowstone Lake as can be had without interfering with the park.

At this hearing I withdrew my previous sanction of the measure and entered an emphatic protest against its passage. It was apparent that, definite assurances to the contrary, its passage would constitute the entering wedge toward utilization of other areas in this park for the same or similar purposes.

No special rule was granted.

MONTANA PROJECT.

But Idaho and Wyoming interests are not the only ones seeking the use of the waters of Yellowstone Lake for irrigation purposes. Practically simultaneously with the inception of the above-described projects, there has been developed an irrigation project in Montana. This project has been highly organized in the nine counties traversed by the Yellowstone River in Montana and is sponsored by the Yellowstone Irrigation Association. Funds for necessary engineering investigations have been actively solicited.

This project, the details of which apparently have not been formally published, contemplates the storage of flood waters only in Yellowstone Lake by the construction of a dam at the lake outlet near the present Fishing Bridge. From the statements of officials and prominent members of the association made in conversation and argument, and from editorials and articles in its newspaper organs, it appears that it is proposed to build the dam only high enough to raise the lake to high-water level. The association secretary recently called this raise 5 feet and later 8 feet in the course of the same conversation.

The objects of this project have been said to be to control the flow of the lower Yellowstone River so as to maintain the river level during July and August above the intakes of many small irrigation systems which tap it on both sides and to prevent spring floods in the lower Yellowstone Valley, which are said to create a large amount of damage each year.

USELESS AS A MEASURE OF FLOOD CONTROL.

A glance at any topographic map of this section will be convincing that by far the greater part of the destructive flood waters, if not all, enter the river from the steep and precipitous watersheds flanking the river on both sides below the lake outlet. These are the waters responsible for any flood havoc, and as a measure of flood control a dam at or near the outlet of Yellowstone Lake would be ineffective. The best engineering practice is to locate dams below where streams leave the mountains and immediately above the tracts to be irrigated unless hydroelectric development is part of the plan.

Furthermore, careful observation during the past year has revealed the fact that at the time floods were occurring in the lower valley of the Yellowstone the water level in Yellowstone Lake and the outlet immediately below was at normal or slightly below. Not once during May did the water ever rise above normal, although the depth of snow at the Lake Ranger Station decreased from 47 inches at the end of April to 0 inches at the end of the month, and at the same time the ice in the lake melted down to a few inches. On every day of the month the Yellowstone River was high at Gardiner, varying from 1 to 5 feet above normal.

THE FEDERAL WATER-POWER ACT.

On June 10, 1920, the President signed an act to create a Federal power commission, to provide for the improvement of navigation, the development of water power, and other purposes. The title of the act is "The Federal water-power act." In its early tentative form the bill was scrutinized by the National Park Service and the form as submitted considered to safeguard the national parks and monuments from commercial invasion for water power or irrigation purposes. When the bill, as finally passed by Congress, was submitted to you for approval before the President's signature in approval was affixed, it was found that it contained provisions opening up all the national parks and monuments for water-power development. The bill, however, was signed with the understanding that amendatory legislation would be presented and passed at the next session of Congress excluding the national parks and monuments from within the scope of the act.

PARKS AND MONUMENTS NOT EXEMPT.

This bill creates a commission which is empowered to issue to citizens of the United States or to corporations licenses for the purpose of constructing, operating, and maintaining dams, water conduits, reservoirs, power houses, transmission lines, or other power project works along and on navigable waters of the United States, or upon any part of the public lands and reservations of the United States. The act then defines "reservations" to include national parks, national monuments, Indian and forest reservations. These reservations, among other public lands, are subject to the commission composed of the Secretary of War, the Secretary of the Interior, and the Secretary of Agriculture. In other words, the national parks and

monuments are taken out of the hands of Congress, which has always retained its immediate jurisdiction over the national parks, and turns them over to the hands of this commission for commercial development.

APPLICATIONS ALREADY FILED.

As a result of this law, applications have been made to the commission for licenses for water-power rights in the Sequoia and Yosemite National Parks, in the Grand Canyon National Park; in fact, there is not a lake or a waterfall in any one of our national parks that can not be levied on for water-power purposes. In the Grand Canyon there are four spectacular waterfalls hidden away in the depths, off the present paths, which in very few years will be the mecca of tourists to the park, that have already been levied on. These wonderful regions, because of their enchanting scenery, have been set aside for all the people of the country, and not for the benefit of a few living in the vicinity directly to be benefited by the diversion of their water exhibits.

It has been learned that the city of Los Angeles has made application to the State water commission for various permits for utilizing water in the Yosemite and Sequoia National Parks. The following examples will indicate the extent to which such applications would affect these parks:

YOSEMITE INVADED.

The city's application, No. 1867, contemplates a reservoir within the Yosemite National Park in Virginia Canyon, near its mouth; also a reservoir in Tuolumne Canyon, to flood Glenn Aulin, together with a conduit which will by-pass the water wheels at California and LeConte Falls, extending to a power house at the mouth of Return Creek. Another intake is to be constructed immediately below this power house and from it a conduit will lead to a power house in Tuolumne Canyon, immediately below Harden Lake.

Their application, No. 1868, for a permit to utilize water for the generation of electrical power, contemplates a storage reservoir on Merced Lake in the Yosemite National Park, with a conduit leading from this reservoir to a power house to be located in Little Yosemite Valley; also a diversion of Illilouette Creek and Buena Vista Creek, at their mouths, with a conduit leading from said diversion to the before-mentioned power house in the Little Yosemite Valley; also a reservoir and diversion at an elevation of 4,000 feet, just below Wawona, with a conduit leading from this point to a power house on the South Fork of the Merced River, at an elevation of 3,500 feet.

SEQUOIA ALSO INVADED.

Their application, No. 1869, contemplates a diversion within the Sequoia National Park on the Marble Fork of the Kaweah River at the road crossing, with a conduit leading from there to a power house on the same stream at an elevation of 2,500 feet; also a diversion of the Middle Fork of the Kaweah River at an elevation of 4,000 feet, with a conduit leading from the point of diversion to a power house to be located one-half mile below the junction of the Marble and Middle Forks of Kaweah River; also a reservoir and diversion at the junction of the Marble and Middle Forks, with a conduit leading

from this diversion to a power house at an elevation of 1,000 feet on Kaweah River.

Their application, No. 1857, contemplates a storage reservoir in Simpson Meadows, another in Tehipite Valley, another at the mouth of Copper Creek (South Fork of Kings River), another at Cedar Grove (South Fork of Kings River), also a power house below Cedar Grove at the junction of the Middle and South Forks of Kings River.

The above will indicate conclusively, I am sure, that unless the Federal water-power act is amended it will sound the death knell of the National Park System as it is now constituted and established.

APPLICATIONS NOT TO BE CONSIDERED NOW.

Through your earnest efforts, the Federal Power Commission has adopted a resolution to the effect that no applications for water rights in national parks and monuments are to be considered until after Congress has had an opportunity to amend the power act by excluding the national parks and monuments from within the scope of its application. Obviously the first thing to be done is to protect these great scenic pleasure and recreation grounds by such amendatory legislation as shall except the national parks and monuments from the provisions of the act.

NATIONAL PARK POLICY FIRMLY FIXED.

When, nearly six years ago, I accepted the department's invitation to undertake in the public interest the development of the national parks into a smoothly running, well-coordinated system, I found in the terms of the invitation, in the attitude toward my new mission among my friends and acquaintances and in the public, in the national attitude of that part of the people who then knew anything about national parks, in the national policy since the creation of the Yellowstone Park in 1872 and the constant repetition of that policy in subsequent national-park legislation, as I found it in practice in the Department of the Interior and learned it from Members of Congress of both parties, and in the principles of more than 40 years that had been developed in the Public Lands Committees and Appropriations Committees of both Houses of Congress, everywhere, I repeat, there was only the one conception of our national parks, namely, that they were areas conserved in a complete state of nature for the use of the whole people and should remain undisturbed in their natural condition for all time.

This conception was later further emphasized by the following paragraph inserted by Congress in the organic act creating the National Park Service, which reads:

The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

PARK POLICY DEFINED.

Furthermore, one year after I had assumed charge of the National Park Service this general conception was again accentuated by the

brilliant announcement of May 13, 1918, by Secretary Lane, in which he laid down the administrative policy to which the National Park Service was rigidly to adhere. (See p. 419 for policy letter.) This policy was based on three broad principles: First, that the national parks must be maintained in absolutely unimpaired form for the use of future generations, as well as those of our own time; second, that they are set apart for the use, observation, health, and pleasure of the people; third, that the national interest must dictate all decisions affecting public or private enterprise in the parks.

It was particularly made clear that "every activity of the service is subordinate to the duties imposed upon it to faithfully preserve the parks for posterity in essentially their natural state." "The commercial use of these reservations," the letter further emphasized, "except as specially authorized by law, or such as may be incidental to the accommodation and entertainment of visitors, will not be permitted under any circumstances."

Could our national park policy be more clearly enunciated? In other words, it is basic that these wonderful scenic areas are to be left forever in their natural state for the enjoyment of present and future generations, and that no commercial use under any circumstances is to be permitted. Since I assumed charge of the parks I have found this conception knit into the very fiber of the national parks idea. In fact, it is the only real distinction between the national parks and the national forests, both of which contain recreational areas of beauty and sublimity; the first a limited group of smaller areas conserved as nature made them, the other a very large group of great areas subject to certain definite commercial uses prescribed by Congress, notably, lumbering, irrigation, and power.

DISTINCTION BETWEEN NATIONAL PARKS AND FORESTS.

In the national parks cattle grazing is permitted only in isolated regions not frequented by visitors and where no injury to the natural features of the parks may result from such use; in the great game sanctuary, Yellowstone National Park, it is prohibited altogether. In the national forests it is one of the great revenue producers.

The cutting of trees for timber is not permitted in the national parks, except where, under the guidance and advice of our landscape engineers, timber is needed in the construction of buildings or other improvements within the parks and can be removed without injury to the forests or disfigurement of the landscape; where the thinning of forests and cutting of vistas would improve the scenic features of the parks; or where destruction is necessary to eliminate insect infestations or diseases common to forests and shrubs. The act of June 4, 1897 (30 Stat., 35), declares the purpose for the establishment of these forest reservations to be to improve and protect the forest within the reservation and to secure favorable conditions of water flows and to furnish a continuous supply of timber for the use and necessities of citizens of the United States. Furthermore, "all waters on such reservations may be used for domestic, mining, milling, or irrigation purposes, under the laws of the State wherein such forest reservations are situated, or under the laws of the United States and the rules and regulations established thereunder."

It is impossible to convey in a few words the insistence and extent with which this distinction has entered even into the veriest minutæ of governmental and congressional procedure during the last 48 years. Every Congress until the last has accepted it in full as the meaning of the law creating the first and all subsequent national parks and has abided fully by and maintained the long-growing precedent thus established. I have the fullest confidence that this same Congress at its next session will recall and maintain the historic national park ideals and continue the far-sighted precedents of its 23 predecessors.

ADMIT POWER PROJECTS, IRRIGATION PROJECTS WILL FOLLOW.

We must realize that had H. R. 12466 passed Congress a policy would have been countenanced that would almost immediately return the national parks to the status of the national forests and utterly destroy their status of national museums of native America. Furthermore, we must realize that if the Federal water-power act is not amended to exclude national parks and monuments, it will not only be illogical but impossible also to keep irrigation dams and ditches, and even commercial lumbering, out of all of our national parks. Then the next step will be to open these areas to hunting in season, as is the case with the national forests. Once a small dam is authorized for irrigation or other purposes, other dams will follow. Once a small lake is raised and a small amount of timber is destroyed, larger lakes will be sought and more timber destroyed and other destruction caused.

Irrigation reservoirs in Yellowstone may be pointed to as precedents for the establishment of the electric railway to Cooke City, which has been fought by friends of the park for 40 years. Permission may be secured to bottle the waters of Apolinaris and Iron Springs; Sulphur Mountain might be carried away; and, finally, where most of the other beautiful features have been exploited commercially, the possibilities are that the upper and lower falls of the Yellowstone would succumb. This latter is not a far-fetched idea, because it was done to Niagara, where tremendous efforts had to be made to save for scenic purposes even two-thirds of the original volume of water that flowed over.

ONE MISSTEP IS FATAL.

Once start the national parks toward the national-forest status and it will be logically impossible to stop short of all. One misstep is fatal. Despite assurances to the contrary, it has been conclusively shown that in the Falls River Basin bill the proponents had their eyes beyond that area and intended the bill to be a precedent for aggressive action tending toward the utilization of Yellowstone Lake, the gem of the Yellowstone. The camel's head would have been in the tent. I have already adverted, in the text, on pages 26, 27, to what effect such projects would have on the lake itself. Who can, at that, tell what effect such huge damming of water beyond the natural levels in that park would have on all the vast geyser basins.

PRECEDENT MUST NOT BE ESTABLISHED.

It will be seen that this danger comes from two sources. Local power interests are after park waters for power and neighborhood

ranchers are after them for irrigation. It all comes to the same thing, for if Congress grants rights to any one claimant for either class of service, eventually it must grant rights to all substantial claimants for both kinds. The precedent must not be established. If even one such privilege is granted under the Federal water-power act, or by special act of Congress itself, the situation will become very difficult. The power act should be amended at the next session of Congress; otherwise, a new precedent will have been established which it will be more difficult to persuade a subsequent Congress to break. And the fact that the next session is the short session makes it imperative to urge this action with the greater insistence.

STATES AS WELL AS NATION WILL LOSE.

The danger from irrigation is less immediate because it will be more difficult for its proponents to push so radical a change through a crowded short session. Your stalwart attitude of defense will also have its great effect. Meanwhile the great silent people of the whole country, including those of the very States counted on to support the Yellowstone dam project, or the Falls River irrigation project, will awake to what not only the Nation but their own States will lose by the debasement and eventual destruction of the National Park System. The West as well as the East has thousands of big-brained, big-visioned business men who will defend the national parks as opportunity offers. Because I am a western man I know the big, silent people of the West, their idealism, their broad Americanism, and their very practical common sense. I shall have no fear of the result when this question reaches them in its national perspective. So far, it has reached them only in its bearing on local ranching interests close to the national parks, and through the efforts to bring it into national politics.

NOT A SECTIONAL QUESTION.

Every thinking American, East and West, strongly favors the long-neglected development of our national water resources, and any attempts to make it appear that the defenders of our national parks are opponents of irrigation and water-power development are bound to fail. I regret that such a tendency has appeared here and there. This is not a sectional question and it can not be made one. The fullest possible development of western water resources is a national policy of the utmost importance to the whole people. So, also, is the development to its modest logical limits of the national-park system. The fact that the national-park system will hold out from commercial use an extremely small proportion of the enormous undeveloped water resources of the country does not prove that the parks' defenders are opponents of national water development. On the contrary, it shows that they are the discriminating seers of a use for this small part of the national waters which is of far greater value to the Nation at large than they could ever be to certain communities living on park borders. In fact, I am confident that the national-park States as a whole realize that the parks, developed according to the farsighted congressional plan of the last half century, will bring so much legitimate advertising and pros-

perity to the institutions, scenic resorts, and general business of these States at large that the profit to certain local interests at the sacrifice of our park policy will seem insignificant in comparison.

NIAGARA, THE SPECTACLE, PAYS.

It has been authoritatively stated that Niagara Falls entertains not less than 1,250,000 visitors each year. It was formerly considered conservative to figure that each of these spends approximately \$20, which gives a travel income of \$25,000,000 accruing to Niagara Falls by reason of its scenic beauty. At the present time this travel income would need to be increased by at least 50 per cent, so that between \$30,000,000 and \$40,000,000 is annually spent to see Niagara, the spectacle, while it has been estimated that Niagara developed as electrical horsepower, at the rates charged at present in a whole-sale way, could at the most produce less than \$15,000,000 of income.

TWO SOURCES OF PROFIT INSTEAD OF ONE.

Moreover, I am convinced that even the farming communities of Idaho and Montana, which are behind the present irrigation campaigns, eventually will become satisfied. In almost every case the identical waters which they now seek in the parks can be fully utilized outside park boundaries. These propositions come before Congress without convincing evidence concerning alternative methods of utilizing the waters, and the impression left on the congressional mind is that unless taken within the national parks these waters will be wasted. But they need not be wasted. It would cost far less, naturally, to take Yellowstone Lake as a gift from Congress than to buy enough private property, say, in Yankee Jim Canyon, on the Gardiner Road, and perhaps below it, to accomplish the regulation of the Yellowstone River. If the benefits to be derived from the lessening of spring flooding and the increase of August irrigation are not worth this investment, what becomes of the enormous estimates of increased profit which are their principal arguments for the damming of Yellowstone Lake? In time the neighborhood ranchers themselves, if not also the professional promoters of these plans, will see the light both from their own use of the park and from the lure the park will be to the eastern man, primarily for recreation, and incidentally getting interested and buying land in the territory through which he must travel in going to and from the park. Two sources of profit are certainly better than one.

ARE WE TO DEPRIVE OUR CHILDREN OF THEIR HERITAGE?

And, finally, we must not overlook another aspect in the preservation of our great scenic areas. Irresistibly the tide of population flows westward. Where 60 to 70 years ago the oxcart of the pioneer tortuously wound its way, to-day bands of steel carry the transcontinental flyers from coast to coast; well-developed highways have replaced the hazardous trails. The settler now often comes in his own motor car to select his homestead. Not only towns, but cities counting their inhabitants by the tens and hundreds of thousands, occupy the States west of the Mississippi. Gradually the great open spaces are becoming settled. As time goes on they will be fewer and

fewer. The empire farms will be divided into smaller holdings, and these again parceled into still smaller ones to accommodate the pressing needs of a growing Nation. Our present census will be over 105,000,000; 100 years from now it will exceed 200,000,000—and what is a hundred years in the life of our Nation. Are we to relinquish even 1 square mile of the choicest exhibits of our great national recreational areas without considering their untold value as the breathing spaces for the countless generations yet to come? Under the stress of increasingly difficult economic conditions, will they not be of infinitely more value 50, 100 years from now than they are at even this period of a joyful, enthusiastic acclamation by the people of the country as a whole? Can not we preserve a few of our magnificent lakes, a few of the priceless waterfalls, without encountering the grasping, calloused hand of commercialism extended to deprive our children of their heritage?

New York, Philadelphia, and other large cities have had to withstand the same insistent demand for the utilization of their great city parks, but as time has gone on the people have thankfully acknowledged the foresight of those who fought valiantly for the maintenance, intact, of their only available breathing places. Saner views have prevailed when demands for the utilization of parts of their parks for other than park purposes were frustrated. And national parks are to our country what city parks are to the municipalities.

Regardless of all facts or figures, therefore, any plan for the commercial exploitation of the parks must by the very nature of its aims and purposes immediately be foredoomed to failure. We must not swerve from the well-defined paths. Good projects, bad projects, indifferent projects all must face the same fate. The great primary principle that the national parks must forever be maintained in absolutely unimpaired form for present generations and posterity has been firmly established by Congress, and until Congress, having the ultimate decision, by legislative mandate annuls or changes this principle it must be faithfully, unequivocally, and unalterably adhered to.

ESTABLISHMENT OF THE NATIONAL PARK-TO-PARK HIGHWAY.

The most notable accomplishment in 1920 in the good-roads movement, in its relation to the national parks, has been the establishment and designation of a great connected highway between the major national parks of the Far West. The great bulk of travel to our national parks being by private automobile, it was long considered that such a highway would not only be a great factor in making these scenic areas more accessible but would aid in the further development of the West by bringing its remarkable industrial resources vividly to the attention of the traveling public and cause many tourists to settle there.

The establishment of this highway has been achieved. The undertaking has been directly in charge of the National Park-to-Park Highway Association, in cooperation with the American Automobile Association and other western organizations, and with the sanction and support of this service.

I desire to give due credit to the following officers and directors of the National Park-to-Park Highway Association: Mr. Gus

Holm's, president, Cody, Wyo.; Dr. George P. Shumacker, vice president, Denver, Colo.; Mr. L. L. Newton, secretary, Cody; Mr. Scott Leavitt, treasurer, Great Falls, Mont.; Mr. Harry Burhans, recording secretary, Denver; Mr. F. J. Chamberlain, president of the Denver Tourist and Publicity Bureau; Mr. Harry N. Wagner, secretary of the Denver Tourist Retail Merchants' Bureau; and Mr. A. L. Westgard, field representative of the American Automobile Association, for their enthusiastic efforts in organizing and successfully carrying out this public-spirited work.

HIGHWAY DEDICATED AUGUST 26.

Given a personal send-off by you, Mr. Westgard started from the Interior Department Building in Washington for Denver in his official pathfinding car on June 1, the actual pathfinding trip itself beginning in Denver on June 28 and ending there August 20. The official designation tour followed the route blazed by Mr. Westgard; it started from Denver on August 26, at which time I formally dedicated the National Park-to-Park Highway with appropriate ceremonies to the American people. The official tour at this writing is still continued. It will end November 9.

With the official party is Mr. Herbert Corey, the well-known war correspondent and newspaper man, who is giving his valuable time and exceptional ability because of his sincere love for the national parks.

GREATEST SCENIC DRIVE.

The national and international importance of the establishment of this highway can not be overestimated, for in extent and grandeur of natural exhibits it surpasses any other scenic drive on earth. Forty-seven hundred miles long, it passes through nine Western States, crosses every main transcontinental highway, and touches most of the north and south highways west of the Rocky Mountains.

It now directly connects Rocky Mountain, Yellowstone, Glacier, Mount Rainier, Crater Lake, Lassen Volcanic, Yosemite, General Grant, Sequoia, Grand Canyon, and Mesa Verde National Parks; the heart of the Continental Divide, geysers, glaciers, ice-clad mountain peaks piercing the sky, crater of long dead volcano filled with wonderful lake of clearest blue water, the only active volcano in the United States, glacier-carved valleys and canyons cut by the action of the elements, thousands of feet deep, mammoth trees, and ruins of cities whose prehistoric inhabitants left no history.

This wonder highway also offers to the tourist the greatest exhibits of wild life in America, and variations in climate along its course from the torrid to the frigid, often within the space of a few hours. An excellent example of this is the run from the San Joaquin Valley to the Sequoia National Park, where by simply going up the mountain one may experience any shade of climate desired. The noon temperature of the valley is tropic; at the gate to the Sequoia National Park the noontide temperature is the same as that at Portland, Oreg. At Colony Mill the temperature at noon shows the same mark as would be observed in British Columbia, while in Giant Forest the mercury at noon stands at the same point it does in Sitka, Alaska.

For years the lure of Europe and the far-distant parts of the earth have caught the fancy of our travelers, but surely a journey over this highway will be convincing evidence of the surpassing glory and beauty of our choicest national possessions—the national parks—and

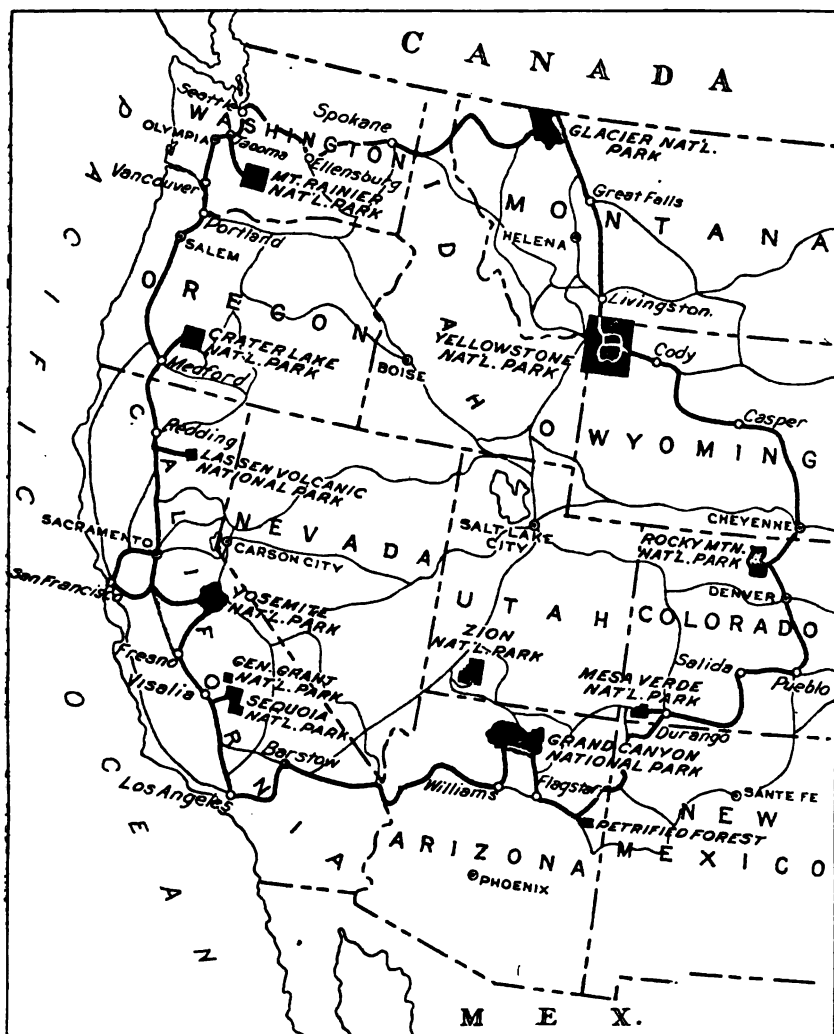


FIG. 1.—Map showing National Park-to-Park Highway and Interpark road system.

the traveler become an apostle carrying into the farthestmost corners the message that our people should see America first.

NUCLEUS OF GREAT INTERPARK ROAD SYSTEM.

While the Park-to-Park Highway will be a well-marked, definite route, in the form of a great circle, it is but the nucleus of a great interpark road system which will later be developed.

From the big circle route there are a number of radiating arteries of existing highways of scenic or historic importance, such as the Columbia River Highway, the Denver Mountain Parks System, the Pikes Peak Highway, and the Yosemite-Lake Tahoe loop, which must be considered an essential part of an interpark road system.

It is also quite evident that there must be a number of alternative routes in the system and a number of what may be termed small circle tours for the use of motorists who can not complete the big trip in one season. For instance, there must be an alternative route from Denver to Salt Lake City, whence sections will run to the western entrance of Yellowstone National Park; to Los Angeles via Zion Park, Bryce Canyon, and the north rim of the Grand Canyon; across to Portland, Oreg., and likewise to Lake Tahoe and Yosemite by way of the Lincoln Highway and the Roosevelt Highway. Again, in Oregon an alternative road should skirt the east side of the Cascades from The Dalles through Bend to Crater Lake National Park, thence east of the California Mountains on El Camino Sierra to Lassen Volcanic Park, Lake Tahoe, and through Tioga Pass to Yosemite, or through Owens Valley to southern California and the Grand Canyon; or perhaps from Crater Lake through the great redwood forests of northwestern California, where I hope another national park will be established in the early future, to Muir Woods National Monument, and thence to Yosemite and Sequoia Parks. There are several other such routes.

All of the States offer exceptional smaller circle tours within the limits of their respective boundaries, which will considerably distribute the interpark travel through their different communities as it passes from one park to the other. Particularly is this true of Montana, whose cross-State roads are being extensively developed.

This great interpark road system will be rapidly developed now that the National Park-to-Park Highway has been designated.

DEVELOP PARK-TO-PARK HIGHWAY FIRST.

It is my sincere hope that all States and local communities through which the Park-to-Park Highway runs will concentrate their funds on these sections before extensively improving other roads. Great rivalry should be developed between the different States in presenting the best roads to the touring public.

FEDERAL AID NECESSARY.

As pointed out in my report of last year, some links of a complete park-to-park system of highways may have to be constructed by the Federal Government without State cooperation. Two important links to complete the Park-to-Park Highway itself undoubtedly will have to be thus constructed. This includes the transmountain road through Glacier National Park and a road from the present Mesa Verde Park Road to connect with the Cortez-Shiprock Highway in New Mexico. Upon completion of these roads the Park-to-Park Highway will pass directly through both national parks. Estimates for the construction of both roads were submitted to Congress last year, but as no new road construction was favored they will again be presented this year.

In certain States through which the highway runs most of the land belongs to the Federal Government and is either unreserved unappropriated public land or reserved for national forests, national parks and monuments, Indian reservations, or under other forms of withdrawal. There is relatively small taxable property under the jurisdiction of the State. Naturally, such country is sparsely settled, and the burden of building permanent roads would be more than the people could bear. In such cases, particularly where the road would be used principally by motorists en route to the national parks from all parts of the United States, it would seem that the Federal Government would be under the obligation of defraying the cost of such of the interpark system. Such a section of the system would be a highway connecting Mesa Verde National Park and the Grand Canyon National Park by way of the Natural Bridges, Rainbow Bridge, and Navajo National Monuments, in southeastern Utah and northern Arizona. Practically all of the land such a highway would traverse is under control of the Federal Government. S. 35, Sixty-sixth Congress, provided for the survey of this route for a national highway, but no action was taken.

OTHER HIGHWAY ASSOCIATIONS ACTIVE.

Mention should also be made of the genuinely constructive work of the principal highway associations in advocating good roads and stimulating travel by motor to the West and to the national parks. The American Automobile Association has contributed in large measure to the good-roads movement, as has the National Highway Association. Both of these national organizations are urging the creation of a distinct Federal department of highways.

All the main transcontinental highway associations have urged the improvement of their respective highways by the States and communities which are traveled, and have given particular encouragement and aid to motorists. Detailed maps and information regarding the local natural attractions of the country traversed, as well as road conditions, have been made available through the establishment of local information offices. The development of the free public motor camps in practically all large-sized western cities and towns has been noteworthy. This idea has been adopted in all the national parks, and attractive free camp grounds are being provided as fast as funds permit. Other highway associations promoting more local highways have been exceedingly active.

GOOD ROADS IMPORTANT FACTORS IN PARK TRAVEL.

This widespread public demand for good roads which came like a tidal wave about four years ago and rolled from coast to coast is still strong, but because of the accomplishments in highway building as a result of this demand we, as a Nation, do not realize the magnitude of highway construction in progress throughout the country. Great as it is, it would be larger but for labor shortage and extreme scarcity and high cost of many materials that enter into the improvement of highways; these have prevented much work being done which was originally contemplated under Federal appropriations and by State and county bond issues to raise funds for construction and improvement purposes.

Many believe this is the high day of highway construction and improvement. I believe the highway improvement and construction program of to-day is but the forerunner of greater expansion in the future; what we are doing to-day is only normal, and will continue until all States have improved lateral and county roads, as well as State highways. Certain progressive States have demonstrated what improved highways will do, how they are important factors in increasing resources by bringing large revenues from tourist travel; other States are insisting that they, too, shall have improved highways and share the benefits of such improvements. Furthermore, when the more fortunate sections of all the States are improved, there will still be additional sections that will demand like recognition and benefits.

It is a conceded fact that general road improvement stimulates automobile travel throughout the entire country. It increases interstate motor travel and summer touring trips, to-day the largest recreational and travel feature of the country. Tours are usually so arranged to include a visit to one or more of the national parks. This form of recreation offers pleasant and interesting pastime, the opportunity of meeting new people and seeing new sections, and imparts that broader knowledge and acquaintance that comes only by personal contact with people and places. The parks attract and entertain by the ever-changing scenery, the animal and plant life in its natural environment, and the endless opportunity for study of the geological and other interesting scientific features available in profusion. The increase in auto travel to the parks successfully demonstrates the value of good roads, and conversely it is true the parks have been a marked influence for the betterment of road conditions. Therefore good roads are the most important factor in our national-park travel, and good roads in our parks, serving as the means to attract the people to the parks, are of the utmost importance in our park development.

PARK ROAD CONSTRUCTION NECESSARY.

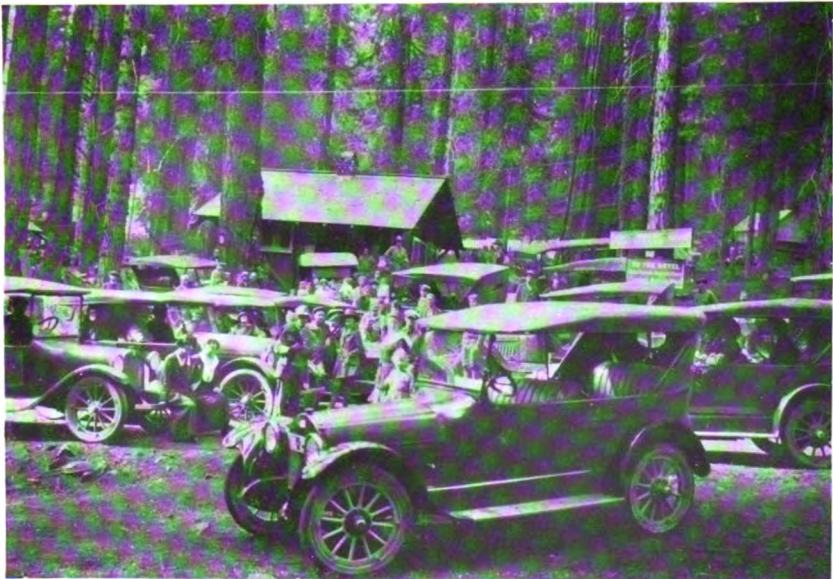
While the national park States have entered upon constructive road-building programs, giving especial attention to the park approach roads, no money has been available for road extension in the national parks for two years, with the exception of the fund provided in 1919 to complete the rebuilding of the El Portal Road in Yosemite National Park. Work on the highways under our jurisdiction has been confined entirely to maintenance and repair, although in some parks the funds available have not been sufficient to prevent perceptible deterioration.

Hundreds of millions of dollars of Federal funds provided by the Federal-aid road act are available in cooperation with the States for building of highways. The same legislation provided for a comprehensive improvement and extension of roads in the national forests. Administration of the Federal road act is lodged with the Bureau of Public Roads, Department of Agriculture. This bureau has particularly studied the approach road needs of the national parks in order that it may fully cooperate with the States in the development of these roads. The Forest Service is also improving the national roads in the national forests which connect with the national-park



A. CAMPERS IN THE GIANT FOREST.

Attractive camps in the shadow of these noble trees are dotted throughout the forest during the season.



B. TOURISTS ARRIVING AND DEPARTING AT GIANT FOREST RANGER STATION.

Here the incoming camper is assigned a camp site by the ranger in charge.

SEQUOIA NATIONAL PARK.



A. THE SIERRA CLUB AMPHITHEATER IN YOSEMITE VALLEY.

This unique out door auditorium was erected by the Sierra Club in cooperation with the National Park Service in 1920.



B. DRIVERS CHECKING OUT FOR THE RUN OUT THE VALLEY.

Traffic on the roads leading into Yosemite Valley is operated on a one-way schedule. Incoming machines must make the run on the odd hours and outgoing on the even hours.

YOSEMITE NATIONAL PARK.

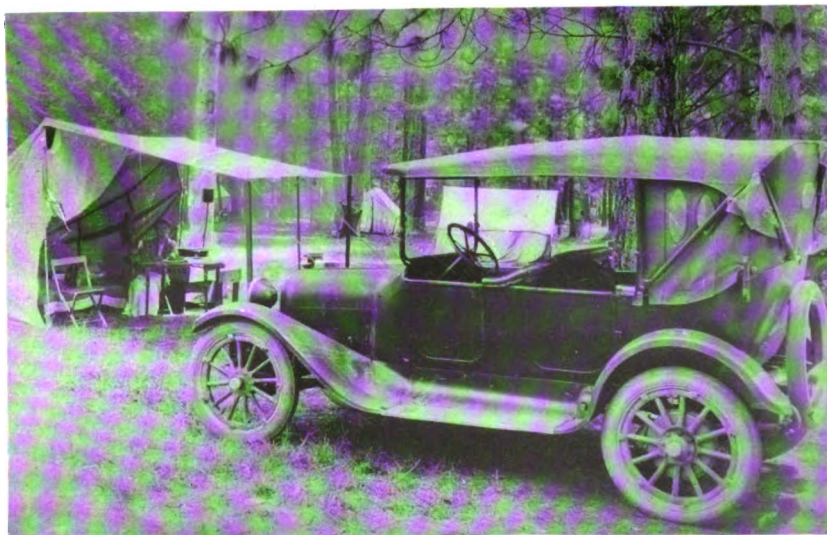
Photographs by National Park Service.



Photograph by H. C. Bryant.

4. A YOSEMITE NATURE GUIDE.

Smelling herbs as a means of identification. These "games" were popular with the children.



B. TYPICAL AUTOMOBILE CAMP IN FREE PUBLIC CAMP GROUNDS.

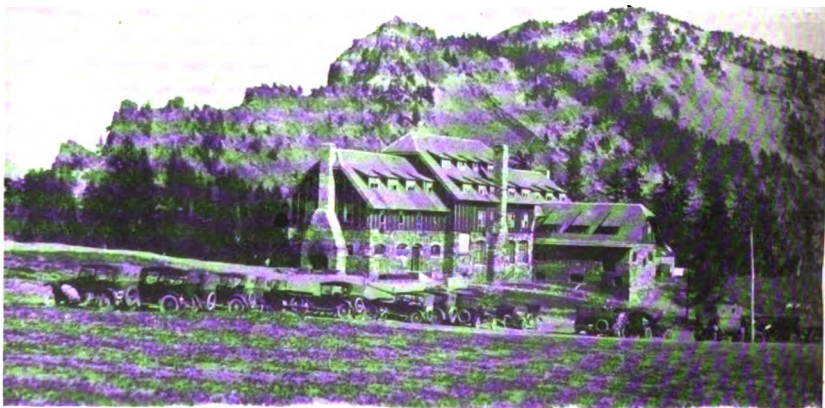
In 1920, 25,000 people camped in the free public camps on the floor of the valley; many of them lived this way the entire summer.

YOSEMITE NATIONAL PARK.



A. MOTORS ON RIM ROAD OVER SKELL HEAD.

The Rim Road, 35 miles in length, entirely encircles the lake, affording dazzling viewpoints 800 to 1,000 feet above the water's surface.



B. CRATER LAKE LODGE ATTRACTIVELY PLANNED BUT STILL UNCOMPLETED.
Every effort will be made to bring accommodations here up to the standard of the other parks, next year.

CRATER LAKE NATIONAL PARK.

Photographs by Alex Sparrow.

highways. Funds available under these measures permits a road-building program extending over a period of years.

PAVING WILL PROVE ECONOMICAL.

The need for improvement and extension of the existing road systems of the parks to meet the ever-increasing private motor travel is unquestioned. Certain of the heaviest traveled park roads should be paved, as this is the only economic means of meeting the constantly increasing road-maintenance expense. The annual cost of sprinkling and maintaining these roads to a satisfactory standard will provide interest charges, maintenance expense after being paved, and establish a sinking fund to repay the indebtedness in from 20 to 40 years, at the same time adding to the enjoyment and comfort of those who use the roads. Surely the motorist has the right to expect from the Government as good if not better roads in the national parks than are furnished by the States and counties as approaches to the parks, especially as the Government exacts an entrance fee from the automobile owner for using the park roads. If this entrance fee is to be continued it seems only fair that these funds should be used for road improvement and maintenance rather than turned into the miscellaneous receipts of the Treasury, as is at present required by the sundry civil act of June 12, 1917 (40 Stat., 153).

There are a number of important new highway construction projects ready to be undertaken, all necessary surveys and estimates having been completed and approved. These projects will later be discussed in detail. A comprehensive road-building program will be presented to Congress in connection with our budget for the next fiscal year, and the condition of our park roads demands that it be given the most earnest consideration.

SAVE THE TREES ALONG OUR HIGHWAYS.

With the development of the National Park-to-Park Highway and the great interpark system of highways, the country is confronted with another necessity—that of saving the trees along highways outside of national-park boundaries themselves. It seems a strange coincidence that, at a time when a movement to plant trees along the borders of our treeless highways is meeting with popular success in the Eastern and Middle States, great effort should be necessary to save strips of forest along the highways of our Western States. That great effort and prompt measures are necessary to preserve the natural beauty of highways imparted by the stands of virgin timber is now recognized. The ax of the lumberman is already hewing the forest and no tree is spared.

My efforts, with the cooperation of the Forest Service, State officials, and private individuals, to preserve strips of timber along the main highways leading from park to park or through the various States have met with some success. In California, Oregon, and Washington particularly gratifying results were encountered, not so much by the actual saving of timber but the stimulation of effort to save it. Through congressional action permitting the exchange of timber on private lands, along the approaches to the park or within sight of tourists, for Government-owned timber located away from the usual

lines of travel, we have for several years been avoiding cuttings in Yosemite National Park that would eventually have presented the most unsightly conditions. Particularly is similar action now desirable along approach roads to Crater Lake and Mount Rainier National Parks, and I have the greatest hopes that with the whole-hearted support of organizations and individuals thoroughly alive to the tremendous value of maintaining the sylvan beauty of land adjoining their main arteries of travel our efforts will eventually not be in vain.

OREGON'S CALL TO ARMS.

Oregon's call to arms, as expressed through the following correspondence of her valiant governor, Ben W. Olcott, is given in the hope that the other States whose forested highways are threatened may act before it is too late.

AUGUST 30, 1920.

Hon. STEPHEN T. MATHER,
Director, National Parks, Washington, D. C.

MY DEAR MR. MATHER.—I believe you will be interested in knowing of the campaign this office has inaugurated for the preservation of the forest beauties of the highways of this State, as will be revealed by a perusal of the inclosed copies of correspondence had. Our campaign seems to have touched a responsive chord with the press and people, as the Oregonian and Telegram have strongly backed the movement, and we are receiving quite a number of letters from prominent people over the State pledging their support. I believe we are going to get some place with this.

Yours, very truly,

(Signed) BEN W. OLCOTT, *Governor.*

In a personal letter to the State highway commission, Gov. Olcott writes:

This question of preserving the natural beauty along the State highways is one which has long been in my mind, and I have been evolving some plan for meeting the situation. Frankly, I have reached no satisfactory conclusion as yet, as to how to go about it to remedy the evil which is presented, but I believe there is some remedy and that Oregon may take steps at this time before it is too late to preserve some of the things with which nature has endowed us.

I most respectfully bespeak the cooperation of your commission in this movement and in any way you may assist. Just what you can do at this time I do not know, but it occurred to me that the members of the commission may be able to outline some method which would help to a certain extent. If it is possible to do so, I hope to be able to secure legislation along these lines which will be beneficial. What that legislation might be I am unable to say at the present time, but it is a matter which will be investigated thoroughly, and every effort will be made by the executive department, at least, toward that end.

The public at large in this State, and thousands of tourists, I am certain, will deeply appreciate the preservation of our natural wonders as far as may be done. I would not for a moment interfere with the legitimate progress of industry, but I believe our industries may thrive without sacrificing the beauties that the Creator has given us.

Placed on a purely commercial basis, we are spending many millions of dollars upon our highways, and we expect to receive a big return on that investment from tourists who annually come to our State to see the things which we have here. If our scenic wonders are destroyed, the tourist will cease to come, and we will lose an enormous financial profit from that standpoint alone. But it is not all a matter of mere dollars and cents. We in Oregon love beauty and all that it means. We wish to see our children grow up in the same environment which has meant so much to us.

I sincerely trust that all Oregonians working together toward this common end will in some way bring about the greatly desired result.

Furthermore, in another personal letter to the president of a large corporation conducting extensive timber operations along Oregon highways, he writes:

While in Clatsop County recently my attention was forcibly directed to the work of devastation of the forests which is going on along the road to Cannon Beach from Seaside. This road to Cannon Beach is probably traveled during the summer months of the year by more tourists than any other in Oregon, and is one of the beauty spots of the State, because of the immense timber and forest growth which surrounds it on all sides. The destruction of the forest is noted with dismay by all tourists as they reach the devastated portion, where the land is being fast denuded of its magnificent timber growth.

As I understand it, your company is cutting this timber. Also that your company has just recently acquired large timber holdings on Tillamook Head adjacent thereto.

I fully realize that the owner of private property has a right to dispose of it as he wishes within the law, and it is not my attempt to in any way curtail our largest industry, but Oregon now boasts of its scenic wonders, which are attracting tourists from all parts of the world. Foremost among these wonders are our forests, and if we could protect the forests, which are immediately contiguous to the highways, we could retain at least a semblance of the beauty which means so much to our State.

If it is possible to do so, I hope to evolve in some way legislation which may protect forests directly along our highways. How far this may go, and in what way it can be done, I can not say at this time, but I am writing you with the hope that possibly you may order the operations along the Cannon Beach Highway directed in such a manner that a portion of the forest along the roadway may be retained for a time, at least, until some steps are taken whereby satisfactory adjustment of this matter may be obtained for both the owners of the timber tracts and the public at large.

One who travels the Cannon Beach Highway and sees the vast difference between the virgin forests and the barren stumpy ground after the forest has been denuded is deeply impressed with the necessity for preservation of such wonderful natural beauty.

The reply to this communication evidences a high public spirit and understanding which promises all possible cooperation on the part of these operators, and is given as follows:

Acknowledging your favor of August 19, beg to state that we are thoroughly in harmony with all practicable procedure looking to the preservation of the scenic beauty of the country and will, therefore, take up with our timber department the feasibility of following your suggestion regarding the road to Cannon Beach.

We are also very much interested in the question of reforestation, but experiments of our own have convinced us that this is a matter for State and Federal Governments and is beyond the efforts of individual or corporate owners, requiring, as it does, action at the present day for results which can only be attained at the lapse of 60 to 75 years.

It may not have been called to your attention, however, that after the present forests are cut an immediate growth of alder and hemlock occurs upon the cut-over portions. This is the case in this particular section of the country. These alders and hemlocks grow quite rapidly and cover, within a comparatively short time, the ground originally occupied by the fir, hemlock, spruce, and cedar and, therefore, obliterate to a great extent the devastated appearance of the lands first detimbered.

It is essential, for the purpose of our industry, that we remove practically all—certainly a very large percentage—of the timber which we own, and it would probably mean a considerable monetary loss to us to reserve any portion thereof, which loss would justly be borne by the State if any of said forests are reserved adjoining the highways. You undoubtedly have this in mind, as your letter very courteously refers to satisfactory adjustment of the matter.

We will, as above stated, obtain an opinion from our forestry department, after which we will gladly communicate with you again and probably arrange an interview with you.

STATE PARKS.

As the hotel in its modern form developed as the natural link between train or boat routes, so must a supplementary service to the modern mode of automobile travel be developed. The close attachment to means of transportation and traveling outfit makes it necessary to find other arrangements for stops than city hotels and garages. We have all of us seen compromises along the highways—automobile tents, trailers, improvised kitchens, and laundries. The people that are indulging in this sort of life are by no means gypsies, but generally staid and home-loving folks who, bound for the romantic and picturesque West, are gratifying a most natural and commendable desire of sightseeing.

I have spoken of the development of free public auto camps in many communities and of the adaptation of the idea to the national parks. It now seems that further development is essential to meet the ever-increasing demand. Many of the States have given thought to the creation of scenic areas within their boundaries as State parks; already a number of States have established a few parks. The State park would therefore seem to be the logical development to provide the motor tourist with the free, open-air breathing spaces which luringly invite him to seek the great outdoors.

A STATE PARK CONFERENCE SUGGESTED.

Frequently suggestions are made for the creation of national parks out of areas which could more appropriately be made State parks. These parks need not necessarily be large, and if the example of the State of Iowa, for instance, could be followed and a study made of all the existing scenic areas within the respective States' boundaries, there would soon be material enough in hand to awaken a large local interest.

I am much interested in the suggestion that a conference be called this winter of all interested in park development, whether national, State, county, or city, for the purpose of considering the furtherance of the State park idea. You have given your cordial support to this movement. One of the subjects to be considered would be uniform legislation in the different States that will make possible the creation of a large number of these State parks. Plans are now under way for calling this conference, during the coming winter, probably somewhere in the Middle West.

AEROPLANES AS A MEANS OF TRANSPORTATION.

Aeroplanes as a means of travel to the parks have been advocated many times during the past few years, but I am not yet prepared to suggest any definite policy regarding this method of tourist transportation. While the aeroplane is coming rapidly to the front as a means of transportation, its utilization as a means of transportation for use in our parks, most of them mountainous, can not be considered until the planes have been equipped and developed to a more definite degree of mechanical perfection. Furthermore there are serious questions involved as to whether it will be desirable to provide for the greater accessibility of the park regions in this manner.

The service, however, is studying the problem and making careful observations of occasional trial flights that have been permitted. A few landings under temporary permit were made this year in the Yosemite, but these were permitted mainly to study the possibilities of landing and take-off at these high altitudes. Landings were not made in any other park.

THE URGENCY OF A SPECIAL FUND FOR FIGHTING FOREST FIRES.

An ever-present menace to the wonderful forest growth of our parks is the forest fire. Particularly in Glacier and Yellowstone Parks have such conflagrations in recent years reached alarming proportions. While it might be said that our other national parks have been practically free from large disastrous fires, due perhaps to the fact that their areas are more quickly accessible than is possible in the Yellowstone and Glacier, the possibility of serious fires remains. The fires always occur in midsummer, during the height of the touring season, when every ranger and every cent of park money are needed for their primary purposes of protecting the public and keeping the park traffic arteries in good shape for travel. In the fiscal year 1919 we spent in Glacier Park alone, in fighting forest fires, the sum of \$65,000 out of our total appropriation of \$85,000 for the year's work in the park. The results were deplorable. All development work, at first curtailed, had later to be stopped, and the park put on a simple administrative maintenance basis until the funds could be replenished by Congress. During the winter months Congress, by deficiency appropriation, reimbursed both the Glacier Park and Yellowstone Park appropriations for every cent expended for fire fighting, but this did not avoid the necessity of stopping immediately important road and trail work, disbanding the organization of road crews that had been laboriously gathered—a whole year's work lost on account of fire fighting, or, rather, because of the lack of a special fire-fighting fund.

Forest fires have again been a menace in Glacier National Park. In August of this year 16 small fires were burning at one time. These fires are seldom the result of carelessness on the part of campers and tourists, but in most instances are caused by lightning. The excessive dryness of the grasses, dead timber, and underbrush makes the park comparable to a powder box, in that it only needs a spark to ignite this material, and unless the small fires thus started can be placed under control without delay it is extremely difficult to prevent serious burnings.

WOULD BE TOUCHED FOR NO OTHER PURPOSE.

It has been my earnest plea that Congress furnish the Park Service a contingent fund of, say, \$100,000, for the sole purpose of fighting fire. The fund should be generous in its provisions, by permitting the purchase of all necessary fire-fighting apparatus and should be available for the entire national-park system. It would be touched for no other purpose. Such a fund will protect the road and trail allotments against depletion at the time the moneys are most needed and insure the development and maintenance of each park on a permanent uninterrupted basis throughout the entire year. I pressed the establishment of such a fund before Congress the past year, and, although

the Senate Committee on Appropriations granted \$50,000 for such a purpose, the item did not pass in conference. In my opinion there is no item in the general appropriations for our forested parks as important as such a fund would be, and I shall make every effort to convince Congress at the coming session of the urgency of making some such provision.

APPROPRIATIONS AND REVENUES.

The appropriations for the current fiscal year amounted to \$973,820, an increase of \$219,625 over the \$754,195 granted in the preceding fiscal year. This last figure is exclusive of \$150,000 granted in 1919 for the construction of a new free bathhouse and administrative building at Hot Springs, Ark., which was reappropriated for the fiscal year 1920. Congress also in 1920, by a special deficiency appropriation, granted \$152,875.76, which included \$12,000 for the emergency construction of a new bridge to replace the old and condemned structure across the Flathead River at the west entrance to Glacier National Park at Belton, Mont.; the remainder was in reimbursement of vital maintenance and improvement funds expended during the summer season in fighting fires in Yellowstone and Glacier National Parks. The net increase of this year's appropriations over those of last is but \$66,749.24.

The estimates of \$2,345,867.50 submitted to Congress for the fiscal year 1921 contemplated starting on a program of road and building construction which included the roads most urgently needed in the proper development of the parks and additional new structures, such as ranger stations, bridges, administrative buildings, etc., whose construction had been deferred for years. On account of the tremendous demands upon Congress due to the necessary financial adjustments of the war, Congress did not sanction the undertaking of any new construction for the year, and all such items, with one exception, were eliminated. This one item was the \$132,000 granted for the installation of a proper sanitation system in the Yosemite National Park.

INCREASE ABSORBED BY HIGHER COSTS.

The actual amount available for protection and maintenance work is only \$841,820, or an increase of \$87,625 over the total amount available for this work during the preceding year, an increase which will be absorbed by the higher cost of labor and materials over the preceding year. Taking into consideration this high inflation in the labor and material market, the service does not have as much money to carry on this year's operations as it did last. Only the most necessary maintenance work is being done. However, Rocky Mountain Park, instead of the \$10,000 heretofore annually available for that park, was granted \$40,000, which permits of additional improvement work, not new construction but work necessary to put existing roads, trails, and bridges into serviceable condition. The urgency of this additional sum may be observed when 95 per cent of the bridges in that park did not have a sufficient factor of safety at the beginning of this year. And so it was with the other parks. Only such work has been possible as served to maintain roads and trails in a somewhat serviceable condition for traffic.

FORTY PER CENT OF APPROPRIATIONS RETURNED IN REVENUES.

The use of the revenues derived from operations in the parks, except those in Hot Springs Reservation, was prohibited after July 1, 1918, by special legislation. The relation of these revenues to the amounts granted by Congress forms a very interesting study. The total appropriations for 1920 amounted to \$907,070.76 and the revenues which were turned into the Treasury amounted to \$316,877.96, which means that approximately 35 per cent of the cost of maintaining the national parks in 1920 was returned to the Government. The appropriation for 1921 of \$973,820 will have as an offset at the end of this fiscal year revenues approaching the \$400,000 mark. Revenues received in Washington to October 1, 1920, now amount to \$206,030.69. This makes it practically certain that 40 per cent of this year's cost will be refunded.

Using \$400,000 as the estimate for this year's revenues, the total cost to the Government in maintaining and developing the national park and monument system for 1920 will be \$573,820. As park travel this year amounted to 1,058,455 tourists, the parks and monuments were maintained at an average cost per visitor of about \$0.55. This is about the cost of a reserved seat at a good movie show. If we estimate the average stay in the park for each visitor at four days, and while I have no actual figure to base this estimate on—I feel sure the estimate is low—it will be seen that the net cost per visitor per day was only a fraction over 13 cents.

PARKS CAN BE MADE SELF-SUPPORTING.

It is my purpose to submit to Congress for consideration at this next session such estimates as will start the parks forward on an adequate development program. This will include a provision granting the Park Service again the use of the park revenues. The war is over. Reconstruction is going forward. Preparation for the future is being undertaken with foresight and enthusiasm. The Americanization movement was never stronger. I earnestly believe that if large appropriations should be made for a few years, so that the roads and trails within the parks may be improved and permanently developed, an enormous volume of travel to every park in the system would be attracted and held, and within a few years the revenues can be brought to a figure approximating the cost of the administration, maintenance, and protection of these reservations.

GIFTS TO THE NATIONAL PARK AND MONUMENT SYSTEM.

From time to time during the past few years Congress has authorized the acceptance of patented lands and rights of way over patented land in the national parks. Under these authorizations property of large value was acquired for the Government without expenditure of public funds. The parks receiving these donations benefited greatly. It was my belief that if a general authorization would be granted by Congress we would be able to secure by donation for the national park and monument system additional property that would be invaluable in developing and promoting these

reservations. Accordingly the department submitted the following proposed legislation:

Hereafter the Secretary of the Interior in his administration of the National Park Service is authorized, in his discretion, to accept patented lands, rights of way over patented lands or other lands, buildings, or other property within the various national parks and national monuments, and moneys which may be donated for the purposes of the national park and monument system.

This provision was enacted into law by the Sixty-sixth Congress in the sundry civil act approved June 5, 1920 (41 Stat., 917). As a result of this authorization I have a number of notable gifts to report.

The National Geographic Society has supplemented its former gift made in 1916 of \$20,000, to aid in the purchase of a part of the Giant Forest in the Sequoia National Park, with additional gifts of \$21,330 for the purchase of further private holdings in or near the vicinity of the Giant Forest. Three tracts of 130, 159, and 320 acres each were purchased at a cost of \$13,130, \$5,000, and \$3,200, respectively, and presented to the Nation. These gifts were made possible by three public-spirited men who had become interested in the society's efforts to save the big trees.

Another equally important gift in the Giant Forest is one of 40 acres, purchased for \$4,000 from the original owner by Mr. and Mrs. Chauncey J. Hamlin, of Buffalo, N. Y., and presented to the United States. This, together with one of the tracts presented by the National Geographic Society, was the last of the stands of big trees in the Giant Forest remaining in private ownership. This noblest of all forests now and forever is the property of the people, thanks to the generosity of the public-spirited donors.

A gift of \$1,500, later increased by several hundred dollars, for the construction of a gateway to the Rocky Mountain National Park was made by Mr. Frank Woodward, of Denver, Colo. This gateway was planned for the Fall River Road entrance; and as the road entered through private lands at the park boundary, the site has been donated to the United States by its owners, Mr. and Mrs. H. E. James. The construction of the gateway has now been completed.

As a result of the Brooklyn Daily Eagle tour to assist in the dedication of the Grand Canyon National Park in April of this year has come a very material gift, a subscription of \$1,835.50 from the members of that party for the erection of a public information building at the canyon. Plans for this building are now under consideration and when completed will be submitted to the committee on design and location appointed by the subscribers for approval.

A gift of \$26,000 toward the construction of the new ranger's clubhouse for Yosemite National Park enabled me to complete that house this year, and dedicate it to the park on September 26. A donation of \$2,000 by a party of visitors to the park at Christmas, 1919, to be used for furnishing the clubhouse provided for a complete equipment by the date of the dedication.

Mr. William Kent, donor of the Muir Woods National Monument, has arranged to make additional gifts of property contiguous to the monument, amounting to 57.68 acres. The Steep Ravine tract, a particularly beautiful wooded gorge, originally planned to have been included in this gift, will be held for later presentation. After certain

water rights have been developed and the necessary lands eliminated, the tract is to be conveyed to the Government.

Mr. Henry Van Kleeck, of Denver, gave 9.6 acres of land in Colorado containing the Aztec Springs Ruins in Montezuma Valley west of the Mesa Verde National Park. This property was accepted, and by presidential proclamation of December 19, 1919,¹ became the Yucca House National Monument.

The act of February 26, 1919,² elevating the former Sieur de Monts National Monument, Me., to national park status as the Lafayette National Park, authorized the Secretary of the Interior, in his discretion, to accept in behalf of the United States such other property on Mount Desert Island, including lands, easements, buildings, and moneys, as may be donated for the extension or improvement of the park. The original 5,000 acres constituting the monument were entirely donated by lovers of the region who desired that it be for all times reserved to the Nation, and it is this area which is now the park. Mr. George B. Dorr, now the park superintendent, and his associates, who have been responsible for this remarkable gift, are now working for the enlargement of the park to round out its natural scenic exhibits. Already more than 5,000 additional acres of land have been donated, and as soon as the titles can be searched out and cleared to be acceptable to the Government, these lands will be added to the park.

IN THE FIELD OF EDUCATION.

Despite keen disappointment resulting from our inability to proceed with the printing of our educational series of publications on account of the acute paper shortage, I have been pleased with the especial attention given to educational possibilities that the parks and monuments offer by farseeing educators, colleges, and other institutions of learning. I will later elaborate on the great educational value of films, slides, and photographs of national-park scenes; too much can not be said in favor of an extensive distribution system of lending such material to our colleges and schools. Courses on the scenic exhibits of the national parks, with especial emphasis on the construction of existing formations by the forces of nature, have already been installed in several of our important seats of learning. Columbia University last year definitely opened a field of national-park study by including that feature in its curriculum. The Iowa State College of Agriculture and Mechanic Arts, at Ames, in developing its course of recreational landscape design in connection with a professional course of landscape architecture, called for copies of all literature of the National Park Service. The service has also aided the college in obtaining a complete set of lantern slides of the national parks to be added to its educational equipment.

LE CONTE MEMORIAL LECTURES.

The University of California, through its extension division, has again conducted a series of lectures dealing with the geology, botany,

¹ See p. 369.

² 40 Stat., 1178.

and folklore of the Yosemite. This "out-of-door school" has proven exceedingly popular, the lectures being offered free to the public. The extension division of that university sought in this presentation only to contribute to the study of nature and to the general enlightenment of scientific subjects relating to the outdoors.

These Le Conte memorial lectures, as they were termed, were instituted in honor of the eminent naturalist and geologist, Joseph Le Conte, who for 30 years was a member of the faculty of that university. The program for the season of 1920, which constituted the second of a course of lectures thus far given, was as follows:

- I. Joseph Grinnell, professor of zoology, University of California.
 1. Special modes of life of some notable Yosemite birds. Tuesday, June 22.
 2. Squirrels, woodpeckers, and jays in relation to sierran forests. Thursday, June 24.
 3. Burrowing mammals as agents of erosion and as natural cultivators of the soil. Friday, June 25.
 These lectures will be given in the Government Pavilion. 8 o'clock.
 Illustrated with stereopticon slides.
- II. Clinton Hart Merriam, research associate, Smithsonian Institution.
 1. Indian tribes of the Yosemite region. Tuesday, June 29.
 2. Customs, beliefs, and modes of life. Thursday, July 1.
 3. Implements and industry. Friday, July 2.
 These lectures will be given in the Government Pavilion. 8 o'clock.
 Illustrated with stereopticon slides.
- III. John Campbell Merriam, professor of paleontology and historical geology.
 1. Le Conte philosophy of evolution. Tuesday, July 6.
 2. Application of Le Conte's philosophy to religion. Wednesday, July 7.
 These lectures will be given at the Le Conte Memorial Lodge. 7.15 o'clock.
- IV. Andrew Cowper Lawson, professor of mineralogy and geology, University of California.
 1. The mountains of Mesozoic time. Tuesday, July 13.
 2. The early Tertiary peneplain and its residual mountains. Thursday, July 15.
 3. The mountains of Quarternary time. Friday, July 16.
 These lectures will be given at the Le Conte Memorial Lodge. 7.15 o'clock.

THE NATIONAL PARKS ASSOCIATION.

Several associations with high public ideals have actively encouraged their members, and through them the people they could reach, to make the largest possible use of the educational possibilities offered by our national parks. Notable among them was the year-old National Parks Association, with headquarters in Washington, D. C. This association, which includes among its officers and members some of the leading educators of the Nation, has for its object a popular scientific understanding of our national parks and monuments. Led by their energetic executive secretary, Mr. Robert Sterling Yard, they have conducted a vigorous campaign against the present attempts to commercialize our parks. Judging by the accomplishments of this association during the first year of its existence, it appears that it is destined to a long and useful career.

THE FAR WESTERN TRAVELERS ASSOCIATION.

I want to point with particular pride and appreciation to the remarkable achievements of one organization that during the past year stood in the vanguard with those who did so much to spread the gospel of "See America First" throughout the Nation. This was

the campaign launched by the Far Western Travelers Association at their annual banquet, held at the Hotel Astor, in New York City, on February 7, 1920, on behalf of the national parks of the Far West. About 1,500 persons attended this banquet, and the preparations for the decorations, the souvenirs, the yearbook, and program for the evening all were pervaded by the national-park spirit, exceeding in scope and attractiveness anything ever accomplished by an association of its kind. Some of the guests traveled all the way from the Pacific coast to attend. There was a spirit of unbounded and typically western enthusiasm about this movement that seemed to carry everything before it toward its final unqualified success. The very fact that this organization, composed of live, hustling salesmen, and having associated with themselves successful merchants, undertook this work showed the rest of the country what red-blooded Americans with a purpose can do for their own scenic possessions before they go for inspiration outside the confines of their own country. It proved to the people of the country the solid value as an opinion maker of the commercial traveler.

From a publicity standpoint their yearbook for the year, dedicated to the national parks, is the finest publication of its kind I have ever seen; it was beautiful, dignified in quality and tone, with an exquisite interpretation of the art of good letters in the text and general get-up, showing in the finished copy the result of the most painstaking effort under skillful expert guidance and unstinted enthusiastic support on the part of the officials and members of the organization.

The Boy Scout movement to the national parks from the East, inaugurated and fostered by the Far Western Travelers Association as one result of the banquet by the sending five Boy Scouts, one from each borough of the metropolis, to the parks under the guidance of a skilled scout master, forms one particular phase of their activities to which they surely can point with pride and satisfaction. This association has started something by its policy of getting into the big constructive movements under the Americanization plan that will forever redound to its honor, and I am confident these traveling salesmen will forever, if by their achievements during this year alone, stand proudly in the forefront of those who are doing big things in a big way for America. In this public manner I again want to thank these busy men for doing such a national service by putting their shoulders to the task of selling the national parks to the people of the country.

FREE NATURE GUIDE SERVICE ESTABLISHED.

The Nature Guide Service inaugurated by the California State Fish and Game Commission in Yosemite National Park for the season beginning June 1 was received with great popular approval. This service was directed by Dr. H. C. Bryant, of the University of California, who was assisted during the height of the season by Dr. Loye Holmes Miller, of the southern branch of the university. The gratifying results of this new movement has convinced me of the great desirability of continuing it next season, and, if possible, on a larger scale than is now being conducted with the active aid of Federal appropriations.

The closest cooperation was given this movement by the various hotel and camping operators, lectures being given two nights each week at both Yosemite Lodge and Camp Curry, and one night at the

Government pavilion at the village. In this way it was possible to present the aims of this service to a large number of people, who, in particular, received the lectures on natural history with the utmost enthusiasm. Field trips were given twice daily, the morning hikes for adults and those in the afternoon for the children. The total of 1,082 adults and 299 children were taken out on these trips during the season, but those in charge have never been able to meet the demands for this particular service.

The lectures and informal camp-fire talks were attended by 25,752 persons and covered the following exceedingly interesting range of subjects:*

LECTURES.

Bird migration in California.
Fish and fishing.
Wild life conservation.
Bird music.
Predatory mammals.
Distribution of plants and animals.
Our national parks.

Nesting waterfowl.
Camouflage in nature.
Instinct and habits of birds.
Common birds of the Yosemite.
The game mammals of California.
Common wildflowers of Yosemite.
Instinct in birds.

CAMP-FIRE TALKS.

The nature guide service.
The mountain lion.
The black bear.
The Douglass squirrel.
The big trees.
The water ouzel.
The band-tailed pigeon.
The snow plant.
The coney.
The harlequin duck.
The rattlesnake.
Toads, frogs, and salamanders.

Snakes and lizards.
The weazel.
Common wild flowers.
Predatory animals.
The owls.
Relation of birds to insects.
The canyon wren.
Bats.
Life zones.
The mule deer.
The geology of Yosemite.

NATURE GUIDE SERVICE WILL GROW.

This nature-guide plan is designed to meet the great insistent demand for information regarding outdoor life. The first test was made in 1918 at three widely scattered resort areas. This was made by the State fish and game commission as part of their work. The course was so successful that the commission, with the cooperation of the California Nature Study League, decided upon wider experiments at Lake Tahoe. Then its extension to the Yosemite was a natural consequence. The system includes a nature play for the children, including "bark feeling," "herb smelling," and other blindfold games. There were nature study hikes for the adults and the adolescents. At the camp fires there were nature-study talks on the mammals, birds, trees, and wild flowers, and movies and lantern-slide lectures on wild life. Sleeping-bag trips into the high Sierra formed interesting accents of the course. The unqualified success of these initial courses in nature study will result, I am confident, in the establishment of similar courses in every one of the larger parks.

It is understood that various States are taking up the nature-guide movement. According to the Playground and Recreation Association

* See the exceedingly interesting report of the Yosemite Free Nature Guide Service on p. 253.

of America, New York State is offering a course in the scientific use of forests as playgrounds and public camping sites in its great public reservations at the Palisades and the Interstate Park, and the Adirondack and Catskill Forests.

Camp-fire educational talks were given also at different times in the Rocky Mountain, Mesa Verde, Yellowstone, Sequoia, and Glacier Parks by various nature guides and volunteer lecturers. A valuable feature of the information service in Yellowstone was the giving of free half-hour talks by Park Ranger Isabel Basset Wasson three times daily. The title of the lecture usually given was "How the Yellowstone came to be." These talks were highly appreciated by the tourists.

The history class of the Union High School of Florence, Ariz., visited the Casa Grande and the Tumacacori National Monuments and historic features of the region in connection with their school work. These popular excursions, included as a part of the regular school work, have been watched with interest and have proved well worth while. Other local high schools are planning to include visits to our historic monuments as part of their school program.

The midsummer double number, July-August, 1920, of *Art and Archaeology*, published by the Archaeological Institute of America, was entirely devoted to our national monuments. This issue, containing many striking illustrations printed in a soft sepia tone, has attracted much attention and well-deserved praise for the comprehensive manner in which the national monuments have been treated.

BOY SCOUTS OF AMERICA.

The educational possibilities of the national parks has also attracted attention of the Boy Scouts of America. At the Far Western Travelers Association's annual banquet in New York City in February, Mr. Huston Thompson, member of the Federal Trade Commission and president of the District of Columbia Council of the Boy Scouts of America, was the principal speaker. An ardent lover of the national parks, it was only natural that he should speak of the vast opportunities of the national parks in educational and Americanization work. He suggested that no finer work could be undertaken by the association than by bringing the national parks to the people, with a boy scout trip as a practical means of doing this. Mr. Thompson's suggestion met with instant approval, and the Far Western Travelers Association at once authorized the amount necessary to defray the expenses of such a trip.

"FAR WESTERN" SENDS NEW YORK CITY SCOUTS.

Five boy scouts, one from each of the boroughs of New York City, were selected to make the trip by the council of Boy Scouts of that city, each selection being the boy who stood first in the scout work in his borough. Mr. Francois E. Matthes, geologist of the United States Geological Survey, who has delivered part of the 1919 series of the Le Conte memorial lectures in Yosemite National Park and an enthusiastic scout master and prominent in scout and educational work, was selected by the Far Western Travelers Association to accompany the scouts on their trip.

The itinerary covered five weeks of travel and included Grand Canyon, Yosemite, Mount Rainier, Yellowstone, and Rocky Mountain National Parks. Receptions were given to the party in each of the principal cities visited by the local councils of Boy Scouts. The trip was a wonderful success and will stand as a monument to the farsighted patriotic ideals of the Far Western Travelers Association. I trust that other associations, clubs, and similar organizations may be able to continue this good work, which makes for better boys and for better Americans.

OGDEN SCOUTS HIKE THROUGH YELLOWSTONE.

The Ogden (Utah) Council, Boy Scouts of America, conducted a 14-day hike through Yellowstone National Park with 85 boy scouts and scout masters, under the direction of Mr. G. A. Goates, scout executive, and Dr. Charles G. Plummer of Salt Lake City, making the trip. Three thousand eight hundred feet of motion picture were made of the trip, which is to be used for educational work before the State councils of Boy Scouts. The leaders of this excursion declared the trip a success and of great educational value to the scouts.

OTHER SCOUT TRIPS.

On the 14th day of June, 217 boy scouts and scout masters from Salt Lake City visited Utah's remarkable scenic exhibit, Zion National Park, spending two days in the park. Among other parties were 12 boy scouts with scout masters from Ottumwa, Iowa, and 22 scouts with scout masters from Logan, Utah, who visited the Yellowstone. Every encouragement is given to parties of boy scouts and girl scouts to visit the national parks, and special attention where possible is given, to give these visits the greatest possible value to these young Americans.

ARCHÆOLOGICAL FIELD WORK.

In Mesa Verde National Park, Dr. J. Walter Fewkes, Chief of the Bureau of American Ethnology, completed his work of restoration of Square Tower House, and then gave his attention to the excavation and restoration of what has been called Painted House. This ruin had always been regarded as a dwelling house and received its name from the unusual number of ancient paintings found on its walls. Dr. Fewkes has disclosed the interesting information that this was the building in which the sacred fire was constantly kept burning. From this place fire was taken to relight extinguished ones in other houses of the community or to start entirely new blazes. This discovery prompted the change in name of this important ruin to New Fire Temple.

Following the completion of this work, Dr. Fewkes excavated and repaired Cedar Tree Tower, a prehistoric ruin hidden among the cedars a mile from Spruce Tree House. This ruin belongs to an architectural type very abundantly represented in the area west of the mesa and with many representatives on the top of the plateau.

No one of these had been excavated by archæologists, and the object of the work was to determine the former use of these towers,

about which numerous guesses had been made, the majority of which rest on very flimsy foundations of facts. While certain of these towers may have been lookouts, the majority served for a different purpose, which has been revealed by the excavation of Cedar Tree Tower. The walls of this ruin have now been completely revealed and repaired, in the progress of which work it was discovered that on the south side it was connected with a circular subterranean room so completely filled with fallen debris that its very existence had not been detected. This room had all the structural features that characterize the sacred room or kiva of the cliff dwellers. Its walls show the highest development of horizontal masonry of the best epoch of the Mesa Verde culture. There are subterranean passageways from it through the floor of the tower, showing intimate connection in use of the two rooms, and a depression cut in the solid rock near the center of the floor of the tower calls to mind the symbolic entrance to the underworld that figures so prominently in Hopi ceremonials. The conclusion is logical that Cedar House Tower, like the adjoining kiva, was a ceremonial building above ground.

Since the completion of the excavation and repair of Cedar Tree Tower, at the close of August, Dr. Fewkes has devoted his field work to the Annex of New Fire Temple, an instructive cliff dwelling about a hundred feet to the east. This has now been completely excavated and repaired, and, although small, presents many significant features. He is now engaged on the excavation and repair of Oak Tree House, situated about midway between New Fire Temple and Sun Temple. The size of this building is about two-thirds that of Spruce Tree House, from which it differs in many ways.

In the progress of the excavation of this cliff dwelling many interesting specimens and several human skeletons in a good state of preservation have been unearthed. The main architectural features of these ruins may be seen by those driving on the new road to Inspiration Point, but those of great scientific value are revealed only by closer inspection. There is probably no road in the world from which one can see so many stately prehistoric buildings as from the quarter mile of the Inspiration Point road that skirts the rim of Fewkes Canyon. Beginning with New Fire Temple and culminating with the superb view from its terminus, Inspiration Point, can be seen on cliffs across deep canyons Cliff Palace, Sun Temple, Community House, and Oak Tree House.

The work of excavating the ruins of Mesa Verde National Park has scarcely begun. It is true the large cliff dwellings have nearly all been examined, but on the mesa there are scores of mounds under which whole villages are buried. It is most desirable that the well-considered plan of operations which has been followed since 1907 be continued under the same cooperative arrangement with the Smithsonian Institution.

The main endeavor of this archæological research work in Mesa Verde for the present centers on the ruins still unexcavated in the area in which lies Spruce Tree House, Cliff Palace, Sun Temple, Square Tower House, Balcony House, Oak Tree House, and New Fire Temple. This area, readily accessible from Spruce Tree Camp, was not only the most populous section of the park in prehistoric times but also contains the largest number of types illustrating the

culture of the cliff people. There remains one large cliff house in this area, known by the name "Community House," and several small ruins as yet nameless. Sooner or later all these will have to be put into proper condition for the study of specialists and inspection of tourists. The areas of prehistoric population known as Mummy Lake area, Spring House area, and others, are archæological propositions of a magnitude for future consideration necessitating larger appropriations than are now yearly available.

Attention was also given to the ruins in the newly created Yucca House National Monument.

CHACO CANYON A POPULAR FIELD.

The possibilities for archæological investigations, explorations, and excavation among the remarkable ruins of the Chaco Canyon group have made that a very popular field for such scientific endeavor. Under a year's permit Dr. Edgar Hewitt, representing the School of American Research of Santa Fe, is centering his activities for excavation and exploration on the one great ruin, Chetro Kettle. Dr. Neil Judd, of the Smithsonian Institution, is in charge of an extensive reconnoissance work undertaken by the National Geographic Society in the Chaco Canyon National Monument, with a view of laying plans on a large scale for future development work. In fact, Dr. Judd's reconnoissance into the prehistoric ruins of the Southwest, with a view of a comprehensive development from the archæological and scientific standpoint, will be one of the most interesting and extensive to this date. Our Southwest is remarkably rich in these ruins, evidencing an existence of a prehistoric people who had attained a high degree of civilization. Prof. Byron Cummings, of the University of Arizona, conducted a summer school in archæology at the Navajo and other southwestern monuments. Thus far, archæological research and investigation has barely touched upon the possibilities.

THE PARKS OUR FIELD LABORATORIES.

As the parks constitute sanctuary for all wild life, they will forever have their place as living museums for zoology students. In the larger parks there is hardly a trip that will not secure a glimpse of bears, deer, or other large game. In the Yellowstone more than 15,000 visitors during the month of July viewed and inquired about the tame buffalo herd located about a mile south of headquarters.

In the major parks monthly bulletins supplement the information conveyed in the printed rules and regulations.

The above gives a fascinating glimpse of some of the educational work that has been accomplished during the year, but serves to accentuate the tremendous possibilities for expansion and enlargement that this line of endeavor holds. Our national parks and monuments were established because of the primary importance of their great scenic and historical background, and naturally there are no localities that hold as rich promises of success to the student investigator and scientists in geology, botany, zoology, anthropology, and ethnology as do these remarkable areas that have been reserved from the public domain in their natural condition for all times for the enjoyment and knowledge of man.

Particularly are these possibilities so fraught with tremendous benefit for our schools, colleges, and universities that I am firmly convinced that the Park Service should eventually have on its permanent staff during the park season paid scientists and scholars of established reputation, who can lecture and develop this field to its fullest extent for the benefit of the great traveling public.

MUSEUMS FOR PARK VISITORS.

One of the most important matters to receive earnest consideration is the early establishment of adequate museums in every one of our parks in which comprehensive exhibits of the flora and fauna, and perhaps the minerals of the region, can be placed. The demands for such exhibits to satisfy the inquiries of the traveling public during the past summer have been particularly insistent. In the Yellowstone, 695 specific inquiries were made during July for a museum. In fact, during that month there was an average of 101 general inquiries a day at the main information office, where the specimens available for inspection created a great deal of interest. The present information rooms proved entirely too small to handle this work effectively, and it was necessary to decrease the publicity until larger quarters can be provided. This is typical of the interest manifested in that phase of development in all of our parks. During the next year it is planned to use the large room in the building formerly a part of Fort Yellowstone as a museum to house specimens of the thousands of objects of interest that the park contains. Many of these specimens have already been collected and marked for exhibition, but the complete exhibit will take several years to collect.

The plans for the new administration building for Yosemite Park provide ample space for a well-equipped museum.

In the Mesa Verde the small museum that has been established to house relics taken from the cliff dwellings and other prehistoric ruins is only second in value of interest to the prehistoric dwellings themselves.

In the Casa Grande National Monument, Custodian Pinkley has exerted much earnest effort to gather a representative collection of prehistoric implements and relics, supplemented by a valuable library on archæology and ethnology and the historical background of the entire region. Plans have been made for a small but adequate museum to house this material, but so far we have not been able to spare funds for its construction out of our small allotment of \$8,000 for the upkeep and maintenance of 24 national monuments.

In other parks, as the Rocky Mountain and Grand Canyon, the superintendents have made collections of specimens of wild flowers, mounted birds, and animals for their offices that are always viewed with interest by the visitor and many questions are asked regarding them. I am very anxious to see these museums established at as early a date as possible.

NATIONAL PARKS IN ADVERTISING FIELD.

A distinctly new field into which the national parks have entered is that of national commercial advertising. This past year many prominent and important industries have used national park pictures in advertising their products to illustrate their magazine and

newspaper advertisements. In every instance this use has been in a dignified and appropriate manner. Many such advertisements have been printed attractively in colors. An automobile tire manufacturer has widely distributed a three-sheet poster for billboard use, which pictures the Yosemite Valley from Glacier Point, with the tire superimposed in the center. The poster is printed in colors, and is not only attractive but is a remarkable example of the lithographic art. Another excellent example of the printer's art in preparing attractive advertisements is the 1920 Yearbook of the Far Western Travelers Association, which features the national parks. In several instances the suggestion for the use of national-park pictures originated in the service and photographs were furnished. In this connection my assistant appeared before the convention of the Associated Advertising Clubs of the World, in Indianapolis, Ind., on June 9, and spoke on the national parks in their relation to national advertising.

PUBLICATIONS.

The serious paper shortage, which vitally affected the printing program of all Federal establishments, also caused annoying delays in the delivery of many of our circulars of information that contain the rules and regulations for the guidance of the tourists within the parks. The shortage was acute throughout the entire season, and it was only with the excellent cooperation of the Government Printing Office that we were able to get many of our rules and regulations out in time to be of service to the traveling public. A new circular on the Grand Canyon was not delivered until the middle of August. The printing of the Le Conte memorial lectures and several pamphlets already set in type had to be indefinitely postponed. A particularly deplorable condition in respect to our publications, however, resulted from the decision that the terms of the old printing law of 1895, limiting the printing of any one Government publication to 1,000 copies in one year for free distribution, applied to those of the National Park Service, except our rules and regulations. As a result of this prohibition our most popular publication, *Glimpses of Our National Parks*, combining in one cover a brief review of the chief features and attractions of the various national parks, and heretofore printed in lots of more than 100,000, was limited to 1,000 copies for free distribution.

As the demand for this pamphlet has always been very heavy it was decided to make it a sale publication under the control of the Superintendent of Documents, Government Printing Office. It is sold for the very small sum of 10 cents, which covers only the cost of printing and paper. It is to be hoped that large editions will be sold.

EDITIONS OF DESCRIPTIVE PAMPHLETS LIMITED TO 1,000 COPIES.

This decision, however, means that similar publications descriptive of our national parks and monuments, and not coupled with the rules and regulations of the parks, will be limited in the future to 1,000 copies annually unless remedial legislation is secured. I earnestly hope that this restriction will be lifted by congressional action, and as the department has already urged the Joint Committee

on Printing that this inhibition be removed as far as the National Park Service is concerned, I have hopes that relief will be granted.

These injunctions affecting our publications are particularly unfortunate at this time because of the absence of a tourist bureau to handle such general information regarding which the public makes inquiry, and particularly in view of the efforts now being made by European nations to recover their prewar tourist travel upon which they are depending more than any other industry to replenish their depleted treasuries.

Large editions of the usual automobile maps were published. A very popular new map showing the National Park-to-Park Highway and the principal automobile highways in the western United States was added to our lists; the base for this map was compiled by the American Automobile Association, which gave permission for its reproduction by the service.

Circulars of information containing rules and regulations were carefully reviewed, corrected, and enlarged. It was interesting to note that although our initial printing this year amounted to the total number of copies ordered during the entire season last year for the various parks, extensive reprints ranging from a third to a half of the number of original copies were imperative before the tourist season was half over. This betokens an unusually popular interest in these publications. Their tremendous value as an aid to effective administration is readily apparent. The publication of such information circulars is an administrative economy, since it limits correspondence regarding details covered therein as well as reduces infractions of police regulations to an insignificant minimum.

Two pamphlets were formerly issued regarding Hot Springs Reservation, one containing the rules and regulations and the other general information. The general information has been added in the rules and regulations pamphlet and hereafter only the one pamphlet will be issued.

Mr. Madison Grant furnished a manuscript dealing with the early history of Glacier National Park. This was printed under the title, *Early History of Glacier National Park*. A small edition was ordered and is distributed free of charge.

An article on the early history of Yosemite Valley, by Ralph S. Kuykendall, printed in *The Grizzly Bear*, official organ Native Sons and Native Daughters Golden West, July, 1919, was reprinted in pamphlet form under the title *Early History of Yosemite Valley*. A small edition is available for free distribution.

General Information Regarding Casa Grande National Monument, Arizona, an abstract of detailed report by J. W. Fewkes, published in the Twenty-eighth Annual Report of the Bureau of American Ethnology, was issued in 1919. The small edition printed is now exhausted. The full report may be consulted at the principal libraries or may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for \$1.25.

PUBLICATIONS SOLD BY SUPERINTENDENT OF DOCUMENTS.

The Superintendent of Documents, having exhausted the sale editions of *Sketch of Yosemite National Park* and an *Account of the Origin of the Yosemite and Hetchy Hetchy Valleys; Forests of Yosemite*

ite, Sequoia, and General Grant National Parks; and Geological History of the Yellowstone National Park, requested authority to reprint these three pamphlets. They were carefully revised and new electrotypes plates were made where necessary and the proper authority granted him for reprinting. These pamphlets sell for 10, 20, and 10 cents, respectively, and can be obtained by purchase from the Superintendent of Documents, Government Printing Office, Washington, D. C. The superintendents of these parks have these publications also on sale in the parks, their supply being furnished direct by the Superintendent of Documents. The increase in the sale of these special publications⁴ in certain of the parks is due in large measure to the attractive way they are being displayed to tourists by park superintendents.

The text for several additional publications was prepared, these being *The Birds of the Papago Saguaro*, by H. S. Swarth; *Plants of Glacier National Park*, by Paul C. Standley; *Mammals of Yellowstone National Park*, by Vernon Bailey; *Wild Animals of Mount Rainier National Park*, by Walter P. Taylor and William T. Shaw; and the *Le Conte Memorial Lectures, Yosemite National Park, 1919 series*, by William Frederic Badé and Francois Emile Matthes. These new publications will be out during the year if the paper situation permits and will be sale publications under the control of the Superintendent of Documents.

FILMS AND SLIDES.

The demands for the loan of motion-picture films, lantern slides, and photographic enlargements showing national-park scenes for publicity and exhibition purposes are increasing from year to year, with a diminishing supply to meet them. Our small stock of motion-picture films has been secured for the most part by the furnishing of positive prints by such motion-picture operators as secured permits from the service for filming park views, supplemented by occasional private donations. It was found advisable this past season to discontinue this requirement for the deposit with the service of one positive print from the motion-picture permit, and we are therefore deprived of this arrangement as a source.

The entire present lantern-slide stock of the service has been donated. Both films and lantern slides available have been used so much that they have been practically worn out, and if we are to continue to meet the demands a new supply is urgently needed.

INCREASED DEMAND FOR PHOTOGRAPHS.

The demand from newspapers and magazines for photographic prints has been particularly insistent this season. The people of the country are taking such a keen interest in our national parks these days that the demands for photographic material from publishers has been overwhelming. Not only with publications of our own country have the refreshing national park scenes proved tremendously popular, but with foreign newspapers and magazines as well. Among others, photographic material loaned for reproduction was

⁴ For list of special publications for sale by the Superintendent of Documents, see p. 395.

used to illustrate articles on our national parks appearing in *El Arte Tipográfico*, a Mexican magazine; in *Ich und die Grosstadt*, published in Berlin; in *Le Miroir*, *La Nature*, and *L'Illustration*, published in Paris; in the *Manchester Guardian* and *The Landmark*, English publications. They were also loaned for reproduction of lantern slides or for lectures in Spanish and Italian colleges, and for foreign guidebooks. These are only a few instances covering a space of several months that show a healthy demand for such material, and it is not exaggeration to predict that publication of such pictures abroad will amply repay the expenditure of a few dollars for photographic material, since they do their important share in stimulating foreign travel to our country and our national parks.

What prints are loaned have been quickly returned, but through wear and tear our stock of photographs has about reached its limit of usefulness. Our photographs available for that work have all been donated by public-spirited individuals and associations, mostly western photographers and tourist bureaus, but the supply of these is entirely inadequate.

Our sole traveling exhibit of 25 photographic enlargements is doing yeoman service. It is temporarily in the custody of the extension division of the Indiana State University, and is being loaned here and there throughout the State. The very fact that this exhibit has been out over two years testifies to its popularity in one State alone. Such exhibits should be multiplied, not only to cover every State in the Union for educational purposes in the schools and other educational institutions, but a dozen sets per State should be readily available. The demand is there and the possibilities of larger distribution of such material are unbounded.

I have had made at my own expense a set of 12 national park pictures, hand-colored and appropriately framed, which I presented to the public school at Darien, Conn. This set could be duplicated at a cost of about \$100, and no finer or more worthy gift to schools or colleges could be made by interested persons.

The National Park Service should be the central distributing agency for all films, lantern slides, and photographs of the national parks and monuments. What finer means of acquainting our public with our great scenic resources than by such exhibits?

A FOREIGN EXHIBIT.

Occasionally a few dollars have been available from our allotment from the department's contingent fund for photographic enlargements, such as were, for instance, furnished the International Alpine Congress, held at Monaco in May of the present year. This exhibit consisted of 12 striking national-park pictures, handsomely double mounted on heavy cardboard and titled in English, with altitudes and distances denoted by the metric system.

After the Monaco congress this exhibit was loaned to Mr. Axel Oxholm, European manager of A. F. Thane & Co., of San Francisco, at Antwerp, Belgium. Mr. Oxholm plans to place it in the booth of A. F. Thane & Co. in the Commercial Fair in Lyon, France, October 1 to 15. This is one of the principal commercial fairs held in Europe. Later it is planned to exhibit these national-park pictures in the United Kingdom, Holland, and other European countries.

SMALL APPROPRIATION NEEDED TO CONTINUE WORK.

The tremendous stimulus to tourist travel of such publicity is at once apparent. The variety and scope of the subjects featured by the slides and film should be made known, and well-prepared sets of lectures issued for educational and entertainment purposes and spread throughout the country. In this manner we would not only educate our people to the true values of these great scenic areas, but there would be instilled in the younger generation that love of nature and pride of possession that can be secured otherwise only through a personal visit to the parks. The visit is then the natural consequence. The initial cost of supplying such exhibits, augmented as they would naturally be by continued occasional donations from interested individuals and societies, would be all that is necessary for establishing a basic nucleus. It need not be a large amount. The transportation charges will be paid by those to whom they are loaned. They will always remain the property of the United States. They should also be available for use abroad, whence many demands for such material are coming. The field for exploiting such publicity work is almost boundless.

For several years I have submitted to Congress an estimate for a small sum from which photographic and other material could be secured, and from which prints of negatives in our possession can be made, but so far without avail. The demands on the service require recognition of this phase of its activities, and it is my purpose to submit to Congress another estimate for a sum for this purpose. I earnestly hope a small appropriation may be granted.

PROTECTION OF OUR WILD LIFE.

Every effort has been made during the past year to improve the condition of wild life in the parks and monuments, to interest the public in this subject, and to promote more careful observation and study of the various species which may be observed under favorable conditions amid natural surroundings. In spite of an unusually dry summer followed by a protracted and severely cold winter in the Rocky Mountain region, losses of big game, except in the case of elk, were surprisingly small. In general, the game has done as well as could be expected under existing conditions and is in excellent condition.

ELK SLAUGHTER SHOCKED WHOLE COUNTRY.

The terrible slaughter of the northern herd of Yellowstone elk during the Montana "open season" shocked the whole country. Between 6,000 and 7,000 elk, fearless of man because of the protection afforded by the national park, were forced by heavy snows to cross the park line into Montana to seek natural food in the lower altitudes and were ruthlessly slaughtered by "hunters." Very pertinent is the following quotation from the May-June, 1920, edition of *Natural History*, the journal of the American Museum of Natural History:

It is estimated that the period of the age of mammals as a whole will likely have closed by the middle of this century—that is, in but a paltry 30 years from this year 1920—through immediate destruction by man. What of conservation? Where are our adequate national and State animal preserves?

ONE BRIGHT SPOT.

There is one bright spot in this connection to record. It was necessary to carry the remnant of the herd through the hard winter by feeding hay. Hay grown and stored for this purpose was soon exhausted, and Government funds available for the purchase of additional hay were at last gone. Snow continued to fall late in the spring, and it was estimated that 100 tons of hay were necessary if the elk were to be saved from starvation. Hay was selling for \$40 a ton, and \$4,000 was needed immediately. On April 8 I sent an appeal for funds to save the elk to organizations and persons I thought would be interested. Four days later \$4,700 had been subscribed and further subscriptions had to be declined. This fund was made available through the generosity of Mr. Wm. C. Gregg, of Hackensack, N. J.; Mr. H. M. Blackmer, of Denver, Colo.; the American Red Star Animal Relief, Dr. W. O. Stillman, director, Albany, N. Y.; and the National Parks Association, Mr. Robert Sterling Yard, executive secretary, Washington, D. C. I found it a privilege to join in this work by including my own small subscription.

The importance of the elk herds in the Yellowstone as a source of supply for restocking other regions is demonstrated by a report prepared by the Biological Survey which shows that nearly 75 per cent of the 4,000 elk which have been transferred by Federal and State authorities during the last 10 years have been shipped from the Yellowstone National Park.

GAME WARDENS FOR MOUNT MCKINLEY NEEDED.

No appropriation has yet been made for the Mount McKinley National Park, and provision is urgently needed for warden service to protect the herds of game in this park. The recommendations for the establishment of State game preserves adjoining the Mount Rainier and Yosemite National Parks are renewed in the hope that they may receive favorable action at the next sessions of the legislatures in the respective States in 1921. Without some such action it is impossible to afford adequate protection to the big game, which, seeking lower levels on the approach of cold weather, is forced to leave the parks when the season is open for hunting under State laws. In the Glacier, Yellowstone, Mount Rainier, Yosemite, Wind Cave, and Sullys Hill Parks the herds of big game have done well, and some of them have shown gratifying increase. A small exhibition herd of buffalo and elk was placed on the Platt National Park early in the year as an added attraction for visitors. The herd of wild buffalo in the Yellowstone now numbers more than 100 head, and the total number of buffalo in the Yellowstone, Wind Cave, Sullys Hill, and Platt Parks now exceeds 600.

DEMAND FOR INFORMATION ON ANIMAL AND PLANT LIFE INCREASES.

Not only have visitors been brought to the park in increasing numbers, but provision has been made for bringing the wild life of the parks more closely to the attention of visitors. A resident naturalist has been appointed in the Yellowstone, and a beginning has been made in assembling for the museum at Mammoth Hot

Springs a representative collection of zoological, botanical, and geological specimens which visitors who so desire may examine more closely than is possible when making a tour of the park. Regular observations have been made on the migration of birds, and the list of species found in the park has been materially increased. In the Yosemite a list of the mammals and summer birds, prepared by Dr. Joseph Grinnell and Mr. Tracy I. Storer, has been published, and the course of lectures given in the park in June and July for the benefit of the public included several addresses by specialists on the wild life of the region. The demand for information on the animal and plant life in the parks increases faster than the means of supplying it, but as rapidly as possible reference lists of the birds, flowers, and trees are being prepared, and before long it is hoped such lists will be available for all of the principal parks. So far as possible, the natural resources of the parks are being developed, not only for recreation but are being made available for educational purposes for the benefit of those visitors who may wish to utilize them as outdoor laboratories for the study of wild life in the field.

The hunting of predatory animals by our ranger forces within the various parks is carried on annually with great diligence and good results. With the cooperation of the Biological Survey of the Department of Agriculture, in a number of instances very satisfactory progress has been made during the past year. A very gratifying increase in deer and other species that always suffer through the depredations of mountain lion, wolves, and other "killers," has been observed.

WILD BURRO A PEST AT GRAND CANYON.

In the Grand Canyon a serious problem has developed through the extraordinary increase in the number of the so-called wild burro. This burro is not indigenous, but descended from native stock left decades past. These animals living down in canyon have increased to such an extent that they form a veritable pest, denuding the plateaus of grass and other forage so that native wild game such as antelope has been forced out; it is even necessary for working and exploring parties to pack feed for their working animals. Furthermore they destroy the trails. Altogether the time is not far distant when radical steps will have to be taken to eliminate the burro evil.

FISHES AND FISHING.

There is no sport in our national parks that is followed with greater enthusiasm and enjoyment than fishing. The Yellowstone, Glacier, Rocky Mountain, Yosemite, Sequoia, Crater Lake, and Lafayette National Parks, in particular, are famous for their fishing, and it was excellent during the greater part of the season. The lakes and streams were kept well stocked, and in Lafayette the Atlantic affords unlimited wealth in variety and size.

A comprehensive fish map of Yellowstone National Park, probably the first of its kind, was prepared under the personal direction of Dr. Hugh M. Smith, the United States Commissioner of Fisheries, and shows all of the fishing streams of the park and the species of the fish to be caught. Copies of the map were placed in various parts of the park and were eagerly consulted by fishermen. Similar maps

should be prepared for the other parks where fishing is available. Information on fishing was added to the general information contained in the published rules and regulations.

PERMANENT FISH HATCHERIES SHOULD BE ESTABLISHED.

While large consignments of fish were planted during the season, the popularity of the sport demands a greater expansion in this work in the future. Permanent fish hatcheries should be established wherever they are needed. The Federal Bureau of Fisheries now operates hatcheries in the Yellowstone and Glacier. The Glacier hatchery, however, should be entirely completed and made more attractive to visitors. In the Rocky Mountain and Sequoia Parks the respective States maintained small hatcheries. In the Yosemite the temporary hatchery established by the California Fish and Game Commission as a preliminary to the construction of a permanent hatchery was dismantled during the season without the installation of the permanent hatchery being effected. I now have assurances that this hatchery will soon be established on an adequate scale. Should circumstances prevent the fulfillment of the work, it should be taken up by the United States.

In the Grand Canyon National Park no game fish exist, the Colorado River containing natively the Gila trout, carp, suckers, and occasionally salmon. An effort has been made to introduce game fish by stocking Bright Angel Creek with eastern brook trout.

An effort has also been made to improve the fishing in Mount Rainier National Park. Through the cooperation of the Pierce County Fish and Game Commission, 10,000 eastern brook-trout fry were obtained. These fish were divided between Reflection and Louise Lakes, as these are the ones most frequently visited in the park. They are at the headwaters of Nisqually and Cowlitz Rivers, and if the fish do well the result will be that not only the lakes but the streams below will be stocked with trout. As an example of what can be accomplished in stocking lakes and streams with fish is the excellent fishing now obtaining in Crater Lake, where one may easily obtain the limit of five fish per day of rainbow and black spotted trout, ranging in weight from 1½ to 4 pounds.

There is no feature of park improvement that appeals more than the maintenance of good fishing waters for park visitors, and I propose to cooperate in every way possible with the United States Bureau of Fisheries and the State commissions in intensively improving the opportunities for the sport of fishing in every national park where this can be done.

THE MOUNTAINEERING CLUBS.

The devotion of the mountaineering clubs to the high ideals of the National Park Service and their affection for the snowcapped mountain ranges of the parks was repeatedly emphasized. By friendly suggestion and constant enthusiastic support in the solution of our problems, these ever-alert friends have, since the establishment of the national-park system, been ready to render aid in maintaining the integrity of the parks and the policies of the service. Even as they in the past helped to defeat determined sheep raids

against some of the parks, they fought against the indiscriminate invasion of the parks for commercial purposes during the past year. The Sierra Club, the Mountaineers, the Mazamas, the Boone and Crocket Club, and others determinedly opposed the opening up of the Yellowstone for irrigation and stood against the application of the Federal water-power act to our national parks and monuments as a whole.

The general secretary of the Associated Mountaineering Clubs of America, Mr. LeRoy Jeffers, during the summer visited Yellowstone and Mount Rainier in the interest of the association.

MOUNTAINEERING CLUB OUTINGS.

On Sunday, December 28, 1919, a party of 125 mountaineers of Washington visited Mount Rainier National Park for their annual winter trip. Most of the party went on foot from Ashford to Longmire Springs and spent the night there; the following morning they walked to Paradise Inn and remained there until January 1. The time was occupied with trips to Sluiskin Falls, the saddle of Pinacle Peak, McClure Rock, and with snowshoeing, skiing, and tobogganing.

On February 20 to 23 the fifth annual winter outing of the Colorado Mountain Club was held at Fern Lake, Rocky Mountain National Park. Weather and snow conditions were perfect, the members later reporting this as their most successful outing. Tobogganning, snowshoeing, and skiing formed their chief entertainment, and during the evening many interesting addresses were given on pertinent subjects.

The Rocky Mountain Climbers' Club held their annual outing August 27 to 29 in Rocky Mountain National Park and climbed Longs Peak; elevation, 14,255 feet.

The Sierra Club of California held their annual outing in the proposed Roosevelt National Park area from July 2 to 31. The Sierra Club is the prime mover in the proposed Roosevelt Park project, having originally proposed the boundaries and have since energetically aided in every manner to have this area, one of the finest in scenic America, created a national park.

A list of the associated mountaineering clubs and their officers is given in Appendix C.

THE WASHINGTON OFFICE. \

Coincident with the tremendous travel to the national parks during the past two seasons, of course, ran increased demands on the entire service forces, but particularly on the personnel of the Washington office. With the exception of one minor clerkship granted last year we were carrying on the burden with the same number of employees, including four details, that were granted at the time of the organization of the service on April 17, 1917, and despite the fact that the work has practically doubled. During the war period our permanent force was able, with the assistance of four employees originally detailed by the department, to carry on the work without serious embarrassment. Although underpaid in comparison with compensation for similar services granted in other parts of the Gov-

ernment service, and despite tempting opportunities elsewhere during the war when such experienced workers were eagerly sought, these employees stuck loyally to their tasks with the faith and hope that their labors would eventually be recognized. I am confident of the correctness of my assertion that no other bureau of the Government found as cheerful, optimistic, and loyal a force of helpers as I have in my administration of the Washington office of the National Park Service, but until the beginning of the present fiscal year no adequate recognition was given them. Upon my earnest representations before the appropriations committees of Congress last winter several new positions to take care of the rapidly increasing work were granted for this fiscal year, together with promotions for every permanent employee of the office except the messenger and the three executive officers.

WITHDRAWAL OF THREE DETAILED EMPLOYEES EMBARRASSES.

The exigencies caused by the application of the Federal retirement act, however, resulted in your office and the Bureau of Pensions withdrawing three of the four detailed employees. As the service is small and the apportionment of work to the number of employees available necessarily is such that each person, with the exception of a few minor clerical positions, handled absolutely individual work, the pressure of work on each employee in his individual line has not permitted the development of such understudies as is practicable in larger organizations. The development of such understudies to be available where employees are temporarily away from their desks or resign is one of the most important administrative requirements of any smoothly functioning office. But each of the details performed individual work. Their withdrawal therefore took away employees who had been handling particular work for which no other person was prepared to step in, thereby quite seriously embarrassing our administrative functions; this was particularly the case with the sole legal officer of the service and the well-trained employee in charge of the film and lantern slide service. You have authorized the detail of a legal assistant from the office of the solicitor temporarily, but until the places thus vacated have been filled by new positions granted by Congress, the service will be inadequately equipped to function as it should. It is therefore my purpose to submit estimates to Congress this year covering such additional, essential employees as will take up the work these details have had to leave, which will enable the service properly to perform its functions as established by Congress. The expansion of our accounting and auditing staff in connection with field inspections and investigations is also a necessity.

It is my sincere belief that the long-urgent needs of the parks along new construction and increased maintenance work will now be fully recognized by Congress, and that through the impelling force of popular approval the parks are rapidly moving on toward their splendid destiny as the recreational wonderlands of the world. With the present permanent force as a nucleus, supplemented by such occasional additional places as the increased popularity of the parks as national health and recreation grounds and their proper administration demands, as well as a true realization of our duties toward the

public in acquainting them with these wonderlands, and with the salaries of the places occupied by the present officials increased to a sum commensurate with the requirements exacted of persons holding such positions, the National Park Service will have been definitely established to perform well its duties on a firm and satisfactory basis.

TRAVEL TOURING DIVISION SHOULD BE ESTABLISHED.

In this connection I can not too strongly reiterate my former recommendations for the establishment of a travel or touring division in the National Park Service. The constantly increasing number of inquiries received by the service indicates a phase of development that the general public is interested in, and which public policy demands shall be fostered and expanded. These inquiries for the most part are about the best methods of reaching the various parks and monuments, and have at times early in the tourist season numbered as many as 200 or 300 a day. They have had to be handled incidental to the duties of our one clerk handling the publications work. This is sufficient evidence that we are not equipped at present to dispose of this work as we should be. A division of travel, with authority to exploit the national parks and monuments and possibly other national recreational resources, and particularly with full authority from the Joint Committee on Printing of Congress to print such desirable pamphlets and publications as bear directly on the attractions and use of these great national recreational areas, I consider now a national necessity.

VALUE OF TOURING DIVISION EASILY SHOWN.

The value of such a touring division can be easily shown. In cooperation with the Department of the Interior, western railroads have many times during the past 10 years assisted in advertising our national parks and monuments. A notable instance was the expenditure of more than half a million dollars by the Santa Fe and Union Pacific at the San Francisco Exposition for exhibits designed to advertise national reservations. In 1916, at the suggestion of the department, the western railroads contributed \$43,000 for the publication of a cooperative booklet, the National Parks Portfolio, promotive of the then existing national parks and monuments; 15 railroads at that time contributed to this joint promotion—perhaps the first occurrence in railroad history that demonstrated the practicability of unified promotive action by the railroads in concert on the one hand and a Government agency on the other. During the year that followed, through our initiative, various railroads were stimulated to added expenditures on behalf of the national reservations. But the operations of the United States Railroad Administration during the war developed one of the most important phases of publicity affecting the national parks that was ever inaugurated, greatly accelerating the tremendous flow of visitors to the national parks and monuments during the 1919 season. This splendid publicity, achieved by the Bureau of Service, National Parks and Monuments, under the able charge of Mr. H. H. Hunkins, of Chicago, did invaluable work in directing the attention of the people of our country to the fact that our country holds as good, if

not far better, scenic areas, and which can be visited at less cost, than anywhere else in the world. The report of that bureau from January 1 to September 30, 1919, showed a list of accomplishments of which the Railroad Administration can indeed be proud, and which vitally indicates the tremendous possibilities of such an establishment. These accomplishments constitute such significant arguments in behalf of the establishment of a national tourist bureau that I can not refrain from dwelling upon their scope to some detail.

WORK OF BUREAU OF SERVICE, UNITED STATES RAILROAD ADMINISTRATION.

During that period this Bureau of Service distributed United States Railroad Administration booklets and folders on 19 western subjects, prepared in cooperation with the National Park Service, to 109 consolidated ticket offices, to 205 tourist agencies and travel bureaus, and to 137 railroads in all parts of the United States and Canada for redistribution to ticket offices other than consolidated ticket offices. These booklets and descriptive folders totaled 1,748,740 copies, including both summer and winter editions, and leaving still available about 250,000 copies for winter use—2,000,000 copies of readable, interesting matter which did more to call the attention of the people of this country to our scenic resources than any other effort made under private or Government initiative.

It also distributed 165,000 copies of our park publications and 200,000 copies of old issues of booklets and descriptive circulars obtained from individual railroads. It supplied me with at least 500 copies of each of the 13 booklets of the national park series for distribution to each Member of Congress, and placed 375 bound volumes of this series of booklets on the observation cars of western railroads. It distributed untold quantities of leaflets listing the United States park publications to thousands of persons who answered advertisements of western tourists' associations, and tendered its services to tourists. It furnished circulars to railroads, consolidated ticket offices, tourist agencies, and travel bureaus on national park topics, including the publication of a 12-page circular of general information on service to and in the national parks. It promoted the circulation of lectures, lantern slides, and motion-picture films on national parks and other western subjects issued by the various railroads, giving 378 separate exhibitions before 115,000 people. It interested editors of eastern railroad magazines in a series of national-park articles, supplying photographs and text, and, acting jointly with the advertising committee of the western lines, placed pictures of national-park views in practically all the consolidated ticket offices of the western regions. It corresponded with convention committees of organizations meeting in the Western States, and distributed printed matter through these agencies, and worked for a more complete representation of the national parks in all joint tariffs throughout the United States.

What an enviable record of achievement! What a splendid example of publicity development!

In addition the United States Railroad Administration published, in periodicals throughout the country, advertisements depicting graphically the allurements of the major national parks.

Upon the return of the railroads to private control early in the year, this great effort ceased with the disbanding of the official organization of the Railroad Administration. Two western railroads, the Chicago & North Western and the Union Pacific, have, however, combined in the maintenance of a Bureau of Service, National Parks and Resorts, with headquarters in Chicago, with satisfactory results.

PARK SERVICE LOGICAL BUREAU TO DEVELOP NATIONAL TRAVEL

The National Park Service is the one Government establishment specifically charged by Congress with the jurisdiction, control, and development of the Nation's most imposing scenic spectacles. The organic act of August 25, 1916, creating the National Park Service, authorized and directed the Secretary of the Interior "to promote and regulate the use of the Federal areas known as national parks, monuments, and reservations by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein, and to provide for the enjoyment of the same in such a manner and by such means as will leave them unimpaired for the enjoyment of future generations." Could its purpose be defined in broader terms, and is basic authority for the development of the tourist industry under the National Park Service to be more explicitly given? Certainly we are authorized in the development of these great natural scenic areas to bring their attractions before the public in such a manner that all may know of them and enjoy their wonderful attractions.

By cooperation with the railroads, highway associations, mountaineering clubs, and travel organizations, this work could be developed to be one of the most profitable ventures carried on under the auspices of the Government for the benefit of the Nation. The National Park Service is already closely connected with the touring public and the great transportation facilities covering the entire United States, and therefore is the only logical place where such a travel division should be located.

That the need for such a travel division has been recognized throughout the country is evidenced by the resolution adopted at the conference of the Tourist Associative Secretaries held in St. Paul, Minn., in November, 1919, by civic associations of San Diego, Calif., and by the Pacific Northwest Tourist Association, urging its creation under the National Park Service.

AS A NATION WE NEGLECT SOME OPPORTUNITIES.

As a Nation we have been neglecting the wonderful opportunities afforded us to develop the travel industry in our own country, for it is a tremendous wealth-producing industry. I venture the assertion that as less than 1 per cent of our travel-loving people yearly visit our great national parks and monuments, not more than that number know the full extent of our national park system or the wonderful opportunities for recreation, education, and physical and mental development it offers. The attractions of the parks should be spread throughout newspapers and magazines over the entire country; schools should be equipped with photographs of our marvel-

ous natural spectacles instead of the pictures of members of reigning families or foreign scenes that are hastily taken down during war-times. Our boys and girls should in their school days be impressed with the wonders of the scenic possessions of their country by lectures, pictures, films, and lantern slides, and until we arrange for this we are derelict in our duty to the growing manhood and womanhood of our country.

I do not mean to say that the Federal Government should bear all the cost of this, but it should have available the basic material from which these exhibits could be duplicated at cost by those who are anxious to obtain them.

STRONG FOREIGN COMPETITION.

And we should go even further than that. Foreign countries are to-day carrying their travel propaganda over the United States. France, Belgium, and Italy are rebuilding their old-time tourist organizations, and they will all make strenuous efforts to recover what was once a most prolific source of income. The Swiss Federated Railroads are spreading broadcast the lures of Switzerland in our newspapers and magazines. The scenic attractions of Canada are exploited in our publications. Tourist bureaus for inducing European travel have sprung up like mushrooms in our eastern cities. France and Spain already have established Government tourist bureaus, and Germany and Italy are planning the same move. Alluring advertisements to induce the American traveler to visit the war-torn battlefields of France and Flanders are encountered constantly. By subsidizing agencies and the payment of high commissions by such agencies, campaigns are waged bringing the attractions of foreign places to the public eye, and such promotion work is being stimulated and expanded wherever the slightest opportunity offers. This is to be expected. That the results are meeting the highest expectations of the countries behind these efforts is well indicated by the travel flowing across the Atlantic; reservations are booked months ahead and many applicants are disappointed.

WE SHOULD SEEK TRAVEL FROM ABROAD.

We should ourselves call the attractions of our scenic area to the attention of foreign countries pictorially, by properly placed exhibits or by pamphlets placed with our commercial representatives. They are continually asking for them. This could all be achieved for a comparatively small outlay of money. A few additional competent employees, the preparation for distribution of well-prepared publications for which we already have the nucleus, and pictorial matter to be furnished to foreign newspapers, magazines, and exhibits, would be all that will be needed to establish this work. In this connection I would call attention to the fine folders issued in Japanese and English by the Toyo Kisen Kaisha Steamship Co., which contain information regarding our national parks.

FOR EXAMPLE.

The value of such publicity was particularly well illustrated in the case of a foreign visitor to the Yosemite during the past winter.

A man, en route from China to Bohemia, when a boy in a little village in the latter country had his attention called to an old woodcut of El Capitan, the wonderful granite monolith of Yosemite Valley. For decades the memory of that picture dwelt within him, but not until this year did he have the chance to realize his dream. Not only did a glimpse of this wonderful scene inspire this visitor to spend additional days in the valley, but it induced him to give up his original purpose of traveling directly across the continent to New York City, and, instead, traveling through California and the Grand Canyon National Park eastward. He later stated that in place of an estimated expenditure of \$500, this extended itinerary resulted in an outlay on his part of over \$1,200 in the United States, money that inured directly to the benefit of the American people wherever he touched. This is only one instance that doubtless could be multiplied into hundreds and thousands were the facts known. Certainly modern advertising offers more tempting mediums of acquainting the public with our scenic attractions than the old-time woodcut that indelibly impressed the outline of one of our great natural features on the brain of a boy.

We have before us the greatest possibilities for developing our tourist travel as an industry, and, what is of the greatest value, every dollar spent in travel to and within our national parks stays right here in this country.

NATIONAL PARKS IN FOREIGN COUNTRIES.

With the cooperation of the Department of State, I have been making an effort to ascertain facts regarding the establishment and number of national parks in foreign countries. Whatever information we have had available heretofore has been meagre, and it is hoped that before the year is over we will have heard from all our inquiries. It is generally understood that the first step in national reservation of areas of primary scenic importance was taken with the establishment of Yellowstone National Park in 1872, although 40 years before that Congress, to save the healing Hot Springs of Arkansas from private exploitation, had set them aside for the benefit of all the people of the country.

Shortly after the visit of the King of the Belgians to the Yosemite and the Grand Canyon the Belgian Embassy stated that one result of His Majesty's visit would be the establishment of the first national park in Belgium. The tract selected by the King is known as Herzogenwald, or the Duke's Forest, located in the neighborhood of Malmedij, on the Belgian-German frontier, and which is the highest spot in Belgium.

Australia has long been in the forefront of the national-park movement overseas, and the Australian National Park in the district of Illiware in New South Wales, bordering on the Pacific Ocean, has a long-established reputation.

Representatives of the Government of Spain have in the past been studying American methods of national-park administration with a view to the establishment of national-park areas in that country. Italy has a law in preparation for the formation of a national park in Gran Paradiso, an area of more than 35,000 hectares, of which 2,200 were offered by the King of Italy; it is planned to make

this a perpetual wild-game reserve. France has a number of excellent national parks, such as those of Oisans, of Peguere, of Esterel, and the Forest of Fontainbleau. Germany has already expressed keen interest in the national-park movement, and inquiries have been made by the Japanese officials regarding the extent of our national-park development. Switzerland has 1, and Sweden 10 national parks. The Argentine Republic, next to Brazil the largest republic in South America, has a national park of great beauty in the comparatively recently established L'Iguazu National Park. The supreme characteristics of this remarkable national-park area are the gorgeous awe-inspiring waterfalls, the total height of which is 60 meters, and of some double falls 30 meters each; the total length of the cataracts is 4,000 meters. It is gratifying to read that that Republic received its inspiration and incentive from the establishment of the Yellowstone National Park, and in the planning of developments such as the construction of hotels, administration buildings, bridges, roads, etc., is following our methods.

Canada's national parks are well known; they constitute one of the greatest assets of her people. Canada has felt that putting money into her national parks has been an investment and not an expenditure. Her national-park bureau was created in 1911, when all the parks, both scenic and historic, were placed under one control. The Canadian park movement resulted first from an endeavor to appraise and then to conserve her natural resources, and secondly from recognition of the need of large recreation areas.

In the bidding for American tourist travel the creation of these national-park areas undoubtedly will play an important part. Every land that has great scenery finds it a great income maker. There is a realization among foreign countries of the tremendous advantages of spectacular scenic possession. Little Switzerland lives on practically nothing else than the income from selling her scenery. Canada's scenery, her Rockies, extensively advertised, developed into her fourth income maker, beating even her fisheries. While the abnormal conditions still prevail in many parts of Europe and the restrictions placed on foreign travel as well as the discomforts attending it have more and more turned the attention of the American people to the scenic beauties of their own country, Europe is making all plans for regaining her old-time tourist travel from America. This is indeed a strong and superior argument for the establishment of a national tourist bureau under the National Park Service.

CALIFORNIA CEDES JURISDICTION.

The legislature of the State of California, by the act of April 15, 1919,^a ceded exclusive jurisdiction to the United States of the territory within the metes and bounds of the Yosemite, Sequoia, and General Grant National Parks, and by act approved June 2, 1920,^b Congress accepted the cession by the State of California of exclusive jurisdiction of the lands embraced within the above-mentioned national parks. As required by section 7 of said act, the United States District Court for the Northern District of California has appointed a commissioner to reside in Yosemite National Park, who

^a See 1919 annual report, p. 306.

^b See p. 382.

has jurisdiction to hear and act upon all complaints made of any violations of law, or of rules and regulations made by the Secretary of the Interior, for the government of Yosemite National Park, and for the protection of the animals, birds, fish, and objects of interest therein, and for other purposes authorized by the act. As required by section 8 of said act, the United States District Court for the Southern District of California has appointed a commissioner for the Sequoia and General Grant National Parks, to reside in one of the said parks, who has similar jurisdiction over these parks.

Mr. C. A. Degnan is the United States commissioner for Yosemite National Park, and Mr. Walter Fry, our former superintendent of Sequoia and General Grant Parks, is now United States commissioner for these parks.

The United States now has exclusive jurisdiction over Yellowstone, Platt, Glacier, Mount Rainier, and Crater Lake National Parks, and the above three national parks in California, making eight national parks of the national-park system over which exclusive jurisdiction is exercised. In the other national parks over which the laws of the State in which they are located obtain great difficulties in administration are at times encountered, owing to the fact that the department has no jurisdiction to punish offenses in violation of the regulations relating thereto, and particularly in the matter of preventing depredations on the game. It is expected that Colorado will follow California's example and cede jurisdiction to the United States of the lands within the Rocky Mountain and Mesa Verde National Parks. Exclusive jurisdiction over Grand Canyon National Park in Arizona and Zion National Park in Utah is also desirable.

MINING CLAIMS—JURISDICTION OF GENERAL LAND OFFICE.

On April 19, 1920, the United States Supreme Court, in the case of *Ralph H. Cameron et al vs. United States*, handed down a very important decision affecting the Grand Canyon National Park, one growing out of long-continued litigation in the General Land Office, involving the validity of certain mining claims asserted by the plaintiff, against whom adverse decisions were rendered in the department. After these decisions claimants continued to assert exclusive right to the possession and enjoyment of the lands embraced in the location, as if the lode claims were valid, and they continued to occupy and use the ground for business purposes, thus obstructing its use by the public, whose interest appears in the following statements of facts and opinion of the court:

This is a suit by the United States to enjoin Ralph Cameron and others from occupying, using for business purposes, asserting any right to, or interfering with the public use of, a tract of land in Arizona, approximately 1,500 feet long and 600 feet wide, which Cameron is claiming as a lode-mining claim, and to require the defendants to remove therefrom certain buildings, filth, and refuse placed thereon in the course of its use by them as a livery-stable site and otherwise. In the district court there was a decree for the United States, and this was affirmed by the circuit court of appeals (250 Fed. 943).

The tract is on the southern rim of the Grand Canyon of the Colorado, is immediately adjacent to the railroad terminal and hotel buildings used by visitors to the canyon, and embraces the head of the trail over which visitors descend to and ascend from the bottom of the canyon. Formerly it was public land and open to acquisition under the public-land laws. But since February 20, 1893, it has been within a public forest reserve established and continued by proclamations

of the President under the acts of March 3, 1891 (sec. 24, 26, Stat., 1095, 1103), and June 4, 1897 (c. 2, 30, Stat., 34-36); and since January 11, 1908, all but a minor part of it has been within a monument reserve established by a proclamation of the President under the act of June 8, 1906 (c. 3060, 34 Stat., 225). The forest reserve remained effective after the creation of the monument reserve, but in so far as both embraced the same land the monument reserve became the dominant one (35 Stat., 2175). The inclusion of the tract in the forest reserve withdrew it from the operation of the public-land laws, other than the mineral-land law; and the inclusion of the major part of it in the monument reserve withdrew that part from the operation of the mineral-land law, but there was a saving clause in respect of any "valid" mining claim theretofore acquired. The United States still has the paramount legal title to the tract, and also has the full beneficial ownership if Cameron's asserted mining claim is not valid. * * *

It is rightly conceded that in the case of a conflict between a mining location and a homestead claim the department has the authority to inquire into and determine the validity of both, and, if the mining location be found invalid and the homestead claim valid, to declare the former null and void, and to give full effect to the latter; and yet it is insisted that the department is without authority, on a complaint preferred in the public interest, to inquire into and determine the validity of a mining location, and, if it be found invalid to declare it of no effect and recognize the rights of the public. We think the attempted distinction is not sound. It has no support in the terms of the mineral-land law, is not consistent with the general statutory provisions before mentioned, and if upheld would encourage the use of merely colorable mining locations in the wrongful private appropriation of lands belonging to the public.

Instances in which this power has been exercised in respect of mining locations are shown in the Yard case (38 L. C., 59) and the Nichols-Smith case (on rehearing) (46 L. D., 20); instances in which its exercise has received judicial sanction are found in *Lane v. Cameron* (45 App. D. C., 404) and *Cameron v. Bass* (19 Ariz., 246); and an instance in which its existence received substantial, if not decisive, recognition by this court is found in *Clipper Mining Company v. Ell Mining Company* (194 U. S., 220, 223, 234).

The argument is advanced that the department necessarily is without authority to pronounce a mining location invalid, because it has within itself no means of executing its decision, such as dispossessing the locator. But this is not a proper test of the existence of the authority, for the department is without means of executing most of its decisions in the sense suggested. When it issues a patent, it has no means of putting the grantee in possession, and yet its authority to issue patents is beyond question. When it awards a tract to one of two rival homestead claimants it has no means of putting the successful one in possession or the other one out, and yet its authority to determine which has the better claim is settled by repeated decisions of the court. And a similar situation exists in respect of most of the claims or controversies on which the department must pass in regular course. Its province is that of determining questions of fact and right under the public land laws, of recognizing or disapproving claims according to their merits, and of granting or refusing patents as the law may give sanction for the one or the other. When there is no occasion to enforce its decisions in the sense suggested, this is done through suits instituted by the successful claimants or by the Government, as the one or the other may have the requisite interest.

Whether the tract covered by Cameron's location was mineral, and whether there has been the requisite discovery, were questions of fact, the decision of which by the Secretary of the Interior was conclusive in the absence of fraud or imposition, and none was claimed. *Catholic Bishop of Nesqually v. Gibbon* (158 U. S., 155, 166, 167); *Burfenning v. Chicago, St. Paul, etc., Ry. Co.* (163 U. S., 321, 323). Accepting the Secretary's findings that the tract was not mineral and that there has been no discovery, it is plain that the location was invalid, as was declared by the Secretary and held by the courts below.

Of other complaints made by the defendants, it suffices to say that, in our opinion, the record shows that the Government was entitled to the relief sought and awarded.

Under this decision the United States can, in the public interest, examine mining claims within national parks with a view to determining their validity, and in the event the claims are proved non-mineral declare them invalid. The decision of the United States

Supreme Court will enable the department to clear up all so-called mining claims in the Grand Canyon National Park.

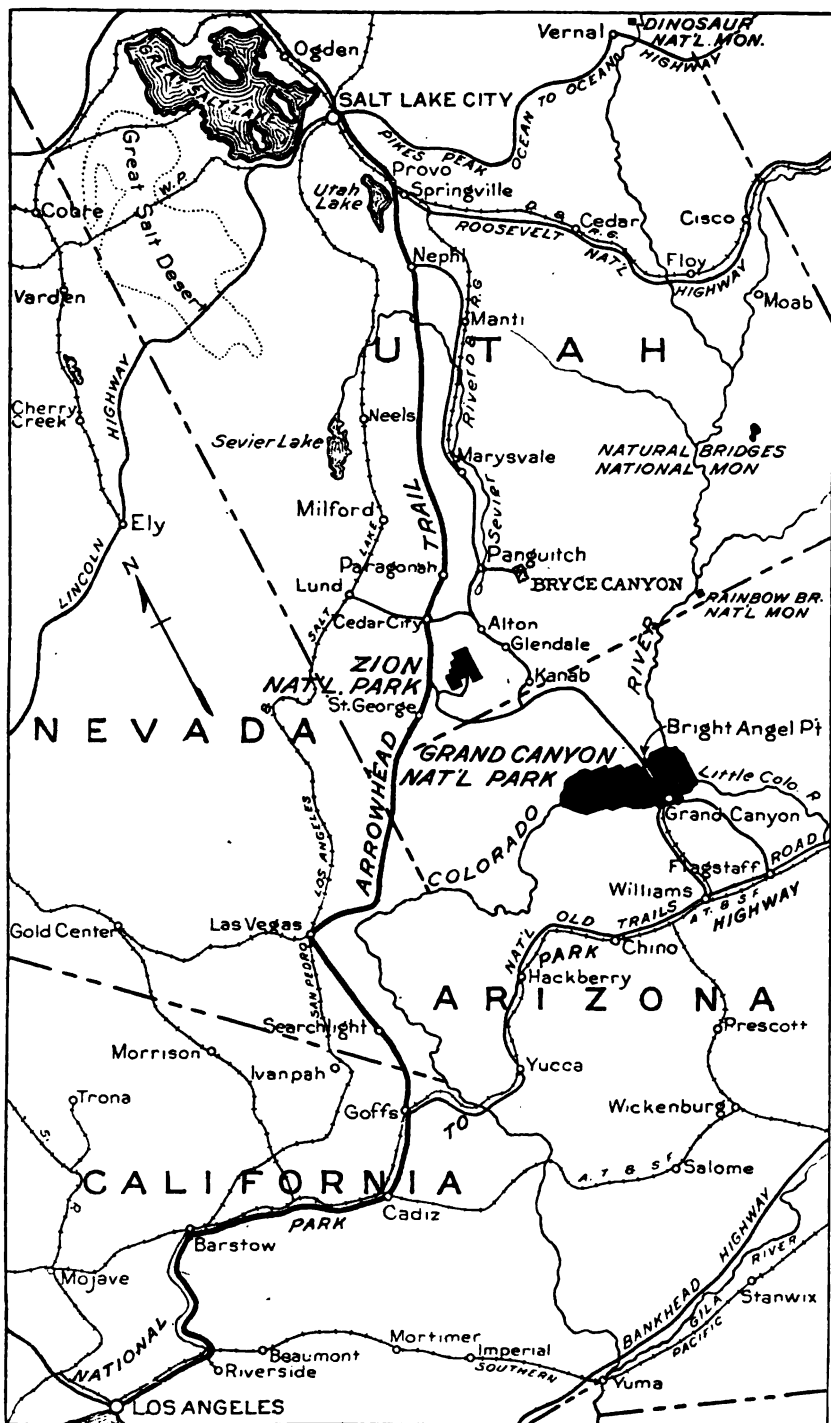
DEDICATION OF THE GRAND CANYON.

The most important event in national-park history during the month of April was the dedication of the Grand Canyon of the Colorado as a national park. The formal dedication occurred April 30, 1920. The Brooklyn Daily Eagle arranged their yearly tour of the national parks so that they might participate in the exercises, their special train arriving the preceding morning. A grand reception at the El Tovar to all the visitors and invited guests on the evening of the 29th inaugurated the festivities, while the pilgrimage on the afternoon of the 30th to the Powell Memorial was perhaps the most fascinating and impressive part of the ceremonies. Many spirited and instructive addresses were presented depicting such subjects as the achievements of the early Spanish explorers of that region, Maj. Powell's thrilling explorations of the canyon, and the legal and administrative history of the park. The principal speaker at the formal dedication on the evening of the 30th was Gov. Campbell, of Arizona, who offered his and the State's services in the solution of the local administrative problems, and Mr. Meier Steinbrink, of the Brooklyn Eagle party, in an eloquent address formally dedicated the Grand Canyon as a national park. The participation of the representative delegation of the Hopi Indians, with their narration of Hopi legends, their prayer chants, and native dances, proved an additional fascinating and colorful feature of the exercises.

ZION NATIONAL MONUMENT BECOMES ZION NATIONAL PARK.

By act approved November 19, 1919, Congress raised Zion National Monument in southern Utah to national-park status. The area has been reserved since 1909, first as Mukuntuweap National Monument and later as Zion National Monument. This added 76,800 acres, or 120 square miles, to our national-park system, and increased the number of parks to 19. The most important scenic feature of the park undoubtedly is Zion Canyon, which bisects it from north to south, 15 miles long and varying in width from 50 to 2,500 feet. There are other canyons and other remarkable scenic effects. The heavy coloring of the entire area has led to its description as the "rainbow of the dessert." This is the region which Maj. Powell, the noted explorer of the Grand Canyon, sighted in the seventies, and which the famous artist Moran and others tried to tell of on canvas; but so startling and brilliant were both the words and oil paintings that for many years it was thought their enthusiasms ran away with their veracity. The area is also rich in historical associations; the early Mormon pioneers chose the canyon for a refuge and called it Little Zion to distinguish it from Zion, by which name Salt Lake City was called at that time.

So remote, however, was it from the lines of travel that not until 1909 was it brought under the protection of the Federal Government as a national monument. Since then its fame has steadily mounted, and particularly has tourist travel to the park been stimulated during the past year. Motor stage service is available daily during the



Approximate Scale, one inch=85 miles.

FIG. 2.—Map showing Arrowhead Trail and principal connecting roads to Zion and Grand Canyon National Parks.

season, May 15 to November 1, from Lund, Utah, a station on the Los Angeles & Salt Lake Railroad, to the public camp in Zion Park. The park is also reached by private automobile from either Salt Lake City or Los Angeles over the Arrowhead Trail. Close cooperation between the State and Federal Government in the construction of the roads is doing its important share in the development of the entire region and making its scenic attractions more accessible. Through the cooperation of the State fish and game commission an area of about 72 square miles on the east side of Little Zion Canyon has been reserved as a State game preserve to afford tourists an opportunity of seeing the deer, mountain sheep, and grouse in their native haunts, and the purpose is to extend the boundaries of this preserve still farther, to take in two full sections of forest and cliff land as a habitation for such animals and birds as thrive in that part of the State. During the past summer the acting superintendent reported the discovery of ruins of ancient cliff dwellings, promising archæological developments of great value.

THE DEDICATION OF ZION NATIONAL PARK.

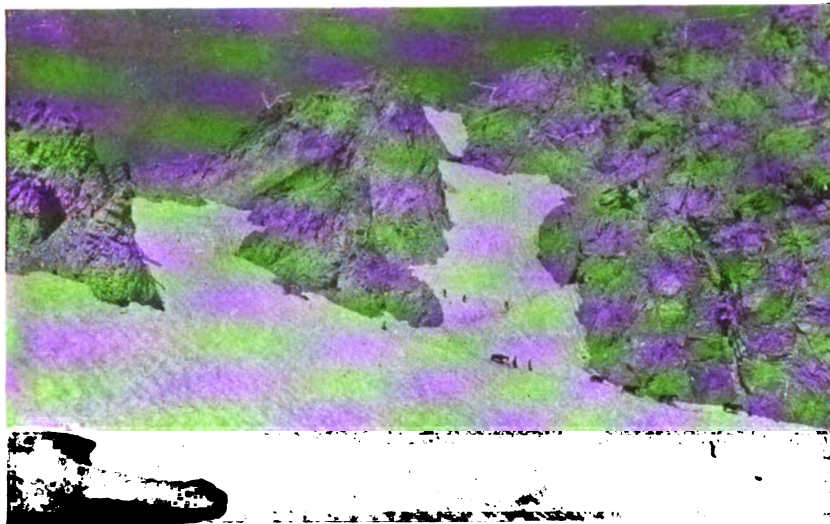
The formal dedication of Zion National Park to its great future as a pleasure and recreation ground for the people took place on September 15, with impressive ceremonies. The event was signalized with warm approbation by the Utah press and public. Senator Reed Smoot, of Utah, and President Heber J. Grant, of the Mormon Church, lauded the beauties of the park in inspiring addresses. Former Gov. William Spry, "the man who fired the opening guns for Zion National Park," emphasized the necessity of good roads to make this beauty spot accessible for all the people; and Major Neslin, of Salt Lake City, dwelt upon the many virtues of the park from a public standpoint. Many other speakers, including representatives of the various railroads traversing Utah and other individuals of prominence, participated in the speaking. Your own telegram of greeting, predicting that the Zion National Park will be a powerful factor in the industrial development of the State, and commenting especially upon the splendid spirit of the State in cooperating in the rebuilding of roads and bridges within the park wiped out by the recent flood, and by the cancellation of advertised sales of school lands located within the park boundaries, was received with enthusiastic applause.

NEW NATIONAL MONUMENTS DURING THE YEAR.

During the past year two new national monuments were created. These were the Scotts Bluff, in the State of Nebraska, established by presidential proclamation December 12, 1919, and the Yucca House, in Colorado, established December 19, 1919.

SCOTTS BLUFF NATIONAL MONUMENT.

Scotts Bluff, the principal feature of the former reservation, was an important landmark for traders and pioneers in the early days of the nineteenth century. The bluff and the hills immediately adjoining it on the west are the highest points in the State; it has also been



Photograph by Walter L. Huber.

ALONG THE JOHN MUIR TRAIL.
Descending snow slope from Shepard Pass.
PROPOSED ROOSEVELT NATIONAL PARK.



THE GRAND TETON FROM JENNY LAKE.
The granite, glacier-bearing, Tetons round out the natural exhibits of the Yellowstone.
PROPOSED GREATER YELLOWSTONE NATIONAL PARK.

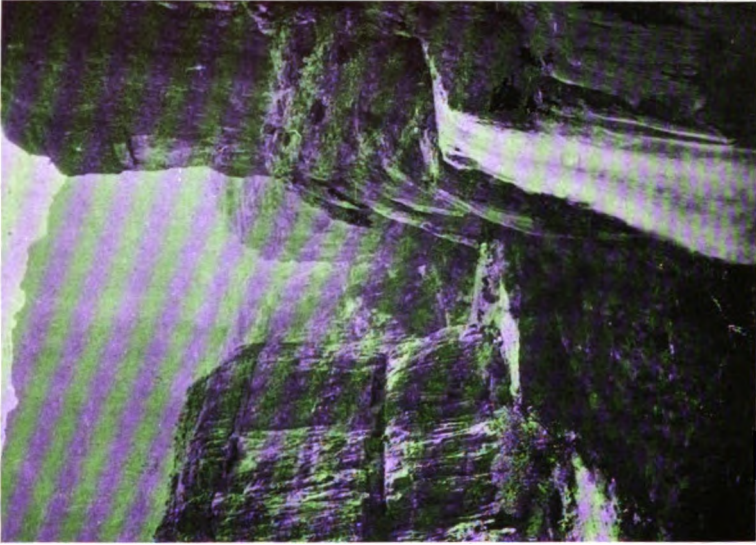


Photograph by Kolb Brothers.

A. HUALAPAI (MOONEY) FALLS, 180 FEET HIGH.

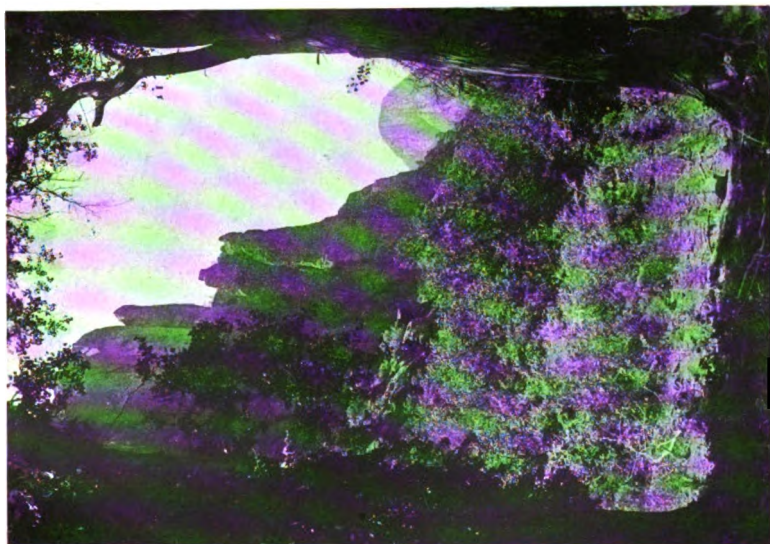
Applications for power rights have already been filed on these lovely falls under the Federal water-power act.

FALLS IN CATARACT CANYON, GRAND CANYON NATIONAL PARK.

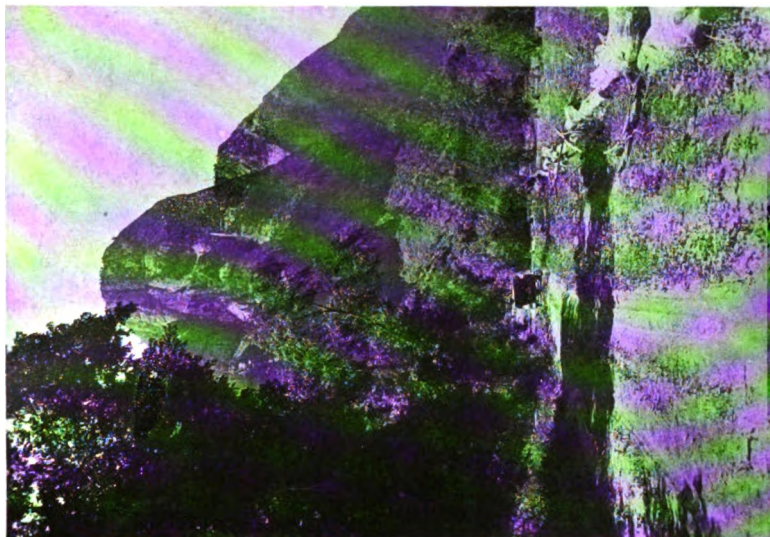


Photograph by W. H. Peters.

B. HAVASU (BRIDALVEIL) FALLS.



4. GLIMPSE OF LITTLE ZION CANYON.
Utah's greatest scenic exhibit.



B. TEMPLE OF THE SUN.
Reached by motor highway from Salt Lake City or Los Angeles.
ZION NATIONAL PARK.
Photographs by Douglas White.



Photographs by Charles Willis Ward.

- A. IT WAS TO SAVE THESE NOBLE STANDS OF REDWOODS IN NORTHERN CALIFORNIA THAT THE "SAVE THE REDWOODS LEAGUE" WAS ORGANIZED IN 1919.**
The entire country has been aroused at the threatened destruction of these noble trees.



Photograph by C. P. Punchard.

- B. DESTRUCTION OF THE OLDEST AND TALLEST TREES ON EARTH IS PRACTICALLY A CRIME.**

What will the next generation call us if we continue to destroy these priceless trees because lumber is "needed" for grape stakes and railroad ties?

PROPOSED REDWOOD NATIONAL PARK, CALIFORNIA.

known as the "Gibraltar of Nebraska." The monument has an area of 2,053.83 acres. Many of the famous old westward trails, including the Oregon and Overland trails, passed either through a mighty cut in this mountain or around its side (it was the route traveled by Buffalo Bill's pony express); and the Mormons also journeyed through on their way to the new Zion. The bluff was popularly named in memory of Hiram Scott, who lost his life here under tragic circumstances in 1828. While returning from a trapping expedition he became ill with fever, and was unable to continue the trying journey with the rest of the party. He therefore stayed behind with two companions, with the understanding that these three would take a boat and float down the river, joining their comrades at a point 100 miles below. The boat overturned shortly after starting, and while the men managed to reach the shore all provisions were lost, and Scott's companions deserted him. In a dying condition he managed to crawl 30 miles, to the bluffs agreed upon as the rendezvous, and there he died. The following spring members of his party visiting the bluff found his skeleton.

Washington Irving, in his historical book, *Bonnerville*, mentions Scotts Bluff, saying that the cliffs of clay and sandstone so resembled towers, castles, churches, and fortified cities, when seen from a distance, that it was scarcely possible to persuade one's self that works of art of human construction were not mingled with those fantastic freaks of nature. In addition to its historical associations in connections with the pioneering movement westward, Scotts Bluff therefore is also important scenically. Even before the national monument was established, hundreds of people visited the area each summer and climbed to the summit of the bluff because of the magnificent view obtainable of the surrounding country.

THE YUCCA HOUSE NATIONAL MONUMENT.

The land embraced within the Yucca House National Monument was donated to the Government by Mr. Henry Van Kleeck, a public-spirited citizen of Denver, to preserve the prehistoric ruins known locally as the "Aztec Springs Ruin." This new reservation, which has an area of 9.6 acres, includes mounds containing ruins of the homes of the prehistoric farmers of the Southwest. These mounds are the best preserved in the Montezuma Valley and indicate that a considerable village once existed here. An investigation of the ruins will, in the opinion of the Smithsonian Institution, shed light on the typical structure of prehistoric Montezuma villages. Some of the mounds apparently cover buildings originally several stories in height. Fragments of pottery found here belong to the varieties called corrugated, the most ancient found in the Southwest. Much of it is decorated inside and out, and it is of a superior character, with an unusual glaze. It is mostly black and white, with a few pieces bright red in color.

The Yucca House Monument is situated near the well-traveled road from Cortez to Shiprock and is readily accessible to visitors. The Indian name of the ruin is unknown, but the Tewa Pueblos, of New Mexico, have a tradition that their ancestors came from the Montezuma Valley of Colorado, for which they have a native word meaning the "valley of the Yucca Mountain." The name "Yucca House"

was therefore considered more appropriate for the new monument than the local one "Aztec Springs Ruin," since the ruins are not Aztec in character and that name is already applied to the great ruin at Aztec on the Animas.

ENLARGEMENT OF GRAN QUIVIRA NATIONAL MONUMENT.

On November 25, 1919, the President, by proclamation, enlarged the area of the Gran Quivira National Monument, N. Mex., from 160 acres to 560 acres. The Gran Quivira has long been recognized as one of the most important of the earliest Spanish mission ruins of the Southwest and, surrounded as it is by numerous pueblo ruins, it furnishes a most fascinating field for explorations by those interested in the early history of our country.

SAVE THE REDWOODS.

I have repeatedly placed the strongest emphasis in my reports upon the urgency of action for saving at least some of the splendid stands of the *Sequoia sempervirens*, indigenous to the coast regions of northern California and southern Oregon, that are fast disappearing under the blow of the lumberman's ax. Their easy accessibility for lumbering operations, together with their enormous sizes, make them a ready target for commercial utilization. It makes the heart bleed to pass through sections of these States and see where thousands upon thousands of these noble monarchs of the forest have been cut down and made into grape stakes. Trees it will take thousands of years to replace are annihilated within a few days. But it is not yet too late to rescue splendid stands for the American people. Prompt concerted action by all friends of the trees will achieve wonders. The publicity given the effort to save these trees by the Save the Redwoods League, ably seconded by nature lovers throughout the country, has been greatly aided by the resolution adopted by the House of Representatives of the United States on May 3, 1920, reading as follows:

Resolved, That the Secretary of the Interior be, and is hereby, directed to investigate and report to the House of Representatives as to the suitability, location, cost, if any, and advisability of securing a tract or tracts of land in the State of California containing a stand of typical redwood trees of the species "*Sequoia sempervirens*" with a view that such land be set apart and dedicated as a national park for the benefit and enjoyment of the people of the United States and for the purpose of preserving such trees from destruction and extinction, and also as to whether or not the whole or any part of such lands or the purchase price thereof would be donated to the United States, and the probable cost of maintaining such lands as a part of the national parks system.

INVESTIGATION NOW BEING CONDUCTED.

An exhaustive investigation under this authorization is now being conducted by the service and the Save the Redwoods League, with the close cooperation of the Forest Service. The final report, I feel confident, will result in remedial legislation on the part of the Congress. A fine monograph by Henry Fairfield Osborn, president of the American Museum of Natural History, entitled, "Save the Redwoods—Sequoia—the Auld Lang Syne of Trees," and an equally

excellent article by Madison Grant, vice president of the New York Zoological Society, that appeared in the New York Zoological Society Bulletin of September, 1919, entitled, "Save the Redwoods," in graphic terms called public attention to the danger threatening the *sempervirens* species.

Many letters have come to Mr. Grant as a result of his stirring article, which indicates the widespread interest this subject evokes. Mr. Grant has kindly furnished us copies of letters from two foreign correspondents, which I will quote.

The noted English botanist, Henry J. Elwes, F. R. S., writes:

I have, for the purpose of my book, *The Trees of Great Britain and Ireland*, personally visited many of the finest forests of the world, in the Himalayas, and southern India, in the Malay Peninsula, in Formosa, where the Japanese Government have taken steps to preserve as a national park some of the wonderful cupress forests of Arisan; in Japan, where the Cryptomeria Avenue at Noyasan shows perhaps the finest planted trees in the world; in Siberia, in Hungary, and in other parts of Europe. I have also visited the finest forests of North America, in the Alleghanies, in Louisiana, in Washington, Oregon, and in California three times, and I say without hesitation that there is nothing so wonderful for beauty, size, and density as the redwood forests of northern California.

Lieut. A. V. N. Franchie, of the French Army, writes:

I had some time ago a French mission over in Seattle, Wash., which inquired as to what kinds of woods they could purchase for use in France. They were attracted by the giant redwood, but since they read an article which was translated in French from the National Geographic, a friend of mine who belonged to this mission, wrote and said: "We would not purchase the redwood if it means the ruin of the beauty of American forests." This said enough. They would look for another kind of wood, for my friend said, further in his letter: "We would look on the Douglas fir or white pine of Alaska or sugar pine from Washington State."

In my opinion, no more important problem in scenic preservation is before the people of the country to-day than the saving of these wonderful trees for the admiration and enjoyment of posterity.

Dr. J. C. Merriam, University of California, Berkeley, Calif., is chairman of the executive committee of the Save the Redwoods League, and Robert G. Sproul is the secretary.

THE PROPOSED MISSISSIPPI VALLEY NATIONAL PARK.

For a number of years that section of Iowa and Wisconsin bordering on the Mississippi River near Prairie du Chien, Wis., and McGregor, Iowa, has been a prominent candidate for parkhood. Friends of the project urge that the scenic nature of the country and the historic background entitle it to such distinction, and preliminary investigation indicates that such recognition would not be unworthily bestowed. In general, the plan includes the utilization of areas covering extensive tracts along the high bluffs of the Mississippi in the neighborhood of those cities, comprising some of the highest and most picturesque along the whole river, whose attractiveness is enhanced by extensive virgin forests in which they are clothed. The locality is said to possess a high degree of botanical, geological, and historic interest. On the Wisconsin side are the heavily wooded bluffs forming a portion of the Wisconsin State Park, which also contains features of archaeological interest.

However, the greater part of the land involved in the project, if not all, appears to be in private ownership; and while undoubtedly some of the owners would be willing to donate their holdings, the greater part of the land would apparently have to be acquired by purchase or condemnation. No funds are available from which the necessary investigations as to the nature and extent and cost of the land considered necessary for such a park can be made, and again here, as in several other present park projects, Congress will be confronted with the necessity of determining whether it will initiate the policy of the acquisition of lands for park purposes from Federal funds. A special investigation would have to be made to present all pertinent facts as to areas, cost, etc., in intelligent form for the consideration of Congress. I sincerely hope that ways and means may at some time be found to add this attractive section to our national-park system for the enjoyment of present and future generations.

THE MAMMOTH CAVE OF KENTUCKY A CONSPICUOUS APPLICANT.

Many efforts have been made in the past to secure the Mammoth Cave of Kentucky, with sufficient adjoining area, including the recently discovered Onyx Cave, to permit of its full development for a national park, but thus far these efforts have been fruitless. Nature's most magnificent, and certainly the largest, limestone cavern, with approximately 40 miles of wonderfully formed underground passages and chambers, it is not only known to every school child in the land but is already the mecca of travelers the world over. The land itself covering the cave and contiguous areas contains thousands of acres of the splendid virgin growth of the deciduous forest growth of the East. Its location at the head of navigation of the Green River contributes another particularly fascinating detail of the richness of that region. Its accessibility, not only to our large centers of population but through ease of approach by motor, rail, and boat, would insure it a popularity in the East that is so common to the major parks of the West. That part of the United States lying east of the Mississippi River contains only one national park, Lafayette National Park, in Maine, which, by the way, is constituted solely of lands contributed by public-spirited citizens. More national parks are needed in the East, and the inclusion of the Mammoth Cave region would add one of the most remarkable of "distinguished examples of typical forms of world architecture" to the proud national-park family. More than that, by virtue of its favorable location, it would at once perform its important function as a breathing spot available to every man, woman, and child of our large industrial centers at a minimum expenditure of money.

Once proponents of the project secured hearings on a bill (H. R. 1666, establishing the Mammoth Cave National Park; hearing held May 3, 1912, before the Committee on Military Affairs, House of Representatives, 62d Cong.) for its purchase. More recently the project has secured fresh impetus, and many of its friends, including local organizations, are rallying to the support of a similar measure. On May 26, 1919, Representative R. Y. Thomas, of Kentucky, an ardent advocate of the project, who has introduced a number of bills in Congress of similar purport, introduced H. R. 3110, but no action has been taken. The property is in private hands, administered

under the terms of a famous will which directs that upon the death of the last-named heir under the will the property is to be sold at public auction. It is understood that the advanced age of the two surviving devisees under the will makes it practically certain that before long the property will be put up at auction and sold to the highest bidder. The famous Mammoth Cave may then go into speculative private hands and be forever lost for development as a national park for the benefit of the people of the country. It may be doubted whether Congress will see fit to appropriate the money needed to acquire the necessary lands. All national parks, with the exception of the Lafayette National Park, have thus far been carved out of the public domain. But certainly the fame of this great natural exhibit should constitute the greatest appeal for an exception to the rule. It is to be hoped that, if Congress can not see its way clear to appropriate the funds necessary to acquire the areas needed, public-spirited parties will acquire it at the auction and donate it to the Government for the benefit of posterity. It ought to become the Nation's property.

THE PROJECT TO RAISE BANDELIER NATIONAL MONUMENT TO PARK STATUS.

Various bills have been introduced in Congress for the purpose of creating the remarkable Bandelier National Monument, in New Mexico, and adjacent areas a national park. While these measures purpose the inclusion of nearly identical areas, they are not uniform in their naming of the proposed park, some proposing to call the new park the National Park of the Cliff Cities, and others contemplating the establishment of the Pajarito National Park. The entire region, favorably located with regard to towns and main arteries of travel, is rich in archæological interest and the objective of many important archæological investigations. Vast numbers of prehistoric ruins of a construction different from any so far incorporated in the monument or park system, with the fine scenery of the entire region, impress this project with possibilities of development as one of our most popular national parks. I am looking forward with great expectancy to the time when congressional action will add this decidedly worth-while region to our national-park system.

THE "CHICAGO DUNES" AREA.

I have for several years been intensely interested in a popular movement to save a section of typical sand-dune landscape bordering the Great Lakes for national-park purposes before the grasping hand of advancing commercialism forever makes it an impossibility. My interest centered on a section of the Lake Michigan beach in northwestern Indiana for a distance of 20 miles west of Michigan City. This region of remarkable sand-dune formation is entirely within the State of Indiana, but because of its proximity to Chicago has become commonly known as the "Chicago dunes." Although there are other sections of the country which may lay claim to notable instances of sand-dune formation, I do not know of any locality where this formation is so extensive and so impressive, or which combines so many features of interest. Rising in places to a

height of 150 feet above the lake level, the contours of the whole are ever varying, in some places "moving" dunes even engulf trees in their steady remorseless progress. Some 8,000 to 12,000 acres would probably be needed for our purposes.

At the request contained in a Senate resolution, I held hearings on this project in the fall of 1916, and the findings have since been published. One serious obstacle to an early accomplishment of the purpose of including this area in national-park ranks, however, is the fact that all of this land is in private hands; and as I have already stated, it has not been the policy of Congress to appropriate Federal funds for such purposes. I fear that unless unofficial bodies and private individuals also become interested in acquiring these holdings the steady expansion of commercial activities along the lake front may result in the loss of these opportunities. Fortunately the people who have been behind this movement and have been diligently fostering the project understand the policies of Congress and are bending their efforts toward interesting such bodies and individuals in the plan. The fact that this area lies close to immense centers of population gives the project many distinct advantages not encountered elsewhere. The possibilities are unexcelled for creating a wonderfully attractive out-of-door resort within easy reach of millions of people, giving exceptional opportunities for picnicking, bathing, and particularly the study of botany, meteorology, and geology. There are striking effects of wind and wave action, while it has been pointed out "that the flora of the region, including the country immediately back of the dunes, is quite distinct, and includes a number of species representative of remote sections both north and south." Before definite action can be taken, however, I believe it essential that a showing be made that enough funds from private subscription are in sight to purchase the land from its present owners and for deeding it over to the United States. In my opinion the area should be a national park instead of a State park, although if the latter could be carried through more expeditiously such a plan should take precedence to the national project.

ENLARGEMENT OF EXISTING NATIONAL PARK AREAS FOR ADMINISTRATIVE PURPOSES.

A number of very important projects have received my careful attention, and also in some form or other the consideration of Congress, that have for their purpose the enlargement of existing park areas, either to take in adjoining scenic areas of a high order or to rectify boundaries. The most important of these constitute the inclusion of the Teton Mountains and adjacent areas to the south of the Yellowstone National Park within that park, the enlargement of the Sequoia National Park to the north and westward to include the wonderful mountain ranges and valleys of the high Sierra, and the extension of Crater Lake to the north to take in Diamond Lake and several mountain peaks urgently needed for the proper development of Crater Lake National Park. These three projects are being pressed before Congress, and have received recognition by the introduction of bills to effect their purpose, the Sequoia and Crater Lake enlargement bills having each passed one house of Congress. The addition of the Mount Evans region to Rocky Mountain National

Park, the extension of Glacier National Park to the section of the park highway traversing the Blackfeet Indian Reservation, and the extension of Mount Rainier National Park to include the Ohanapecosh Hot Springs are also being supported by the National Park Service and the department, and have my earnest approbation. Changes in the boundaries of Yosemite, Rocky Mountain, and Wind Cave National Parks are also considered vital to eliminate private holdings in sections, to add desirable scenic areas or for administrative reasons. I will enlarge on these projects in my discussion on the needs of these respective parks further on in my report.

PROPOSED NATIONAL MONUMENT AREAS.

The service has had under consideration a number of proposals to establish new monuments.

A POSSIBILITY IN FLORIDA.

One particularly interesting possibility arose through the public-spirited offer of Dr. Leslie Weedon, of Tampa, Fla., to donate to the United States some 40 acres of land on an island on the west shore of Tampa Bay. Scenically alone the area is said to be distinctive and of very tropical beauty. Its chief claim for consideration as a national monument, however, lies in the statements of the proposed donor that nearly 400 years ago De Soto and his expedition entered Tampa Bay, which was named by him *Espiritu Santu*. From these shores began that famous exploration of the continent which ended in De Soto's death, the first extensive exploration of at least six of our Southern States, the discovering of the Mississippi, and the first voyage upon it by Europeans. From the journal of the private secretary of De Soto is said to have been established that landing was made on the west shore of the bay, but completed neither at one place nor another; he also mentions in some detail an Indian village which stood near the beach upon a very high mount which, from traces of former habitations encountered, is said can apply only to this island. The tract bears traces of rare prehistoric ruins. A ridge of shell and earth 10 to 30 feet high and from an eighth to a quarter of a mile wide, apparently of artificial construction, appears as evidence of the abode of a large number of people, perhaps long before the landing of De Soto, the headquarters of a prehistoric community. Interesting relics are picked up from the surface and shallow excavation exposes skeletons and other exhibits on which history or tradition throw no light. No official investigation for the service has yet been possible, but the island is typical of the richness of history and romance which has attached to those shores since the sixteenth century and merits careful consideration.

SAVING THE PALM *WASHINGTONIA FILIFERA*.

From time to time efforts have been made to save some of the remaining groves of the palms *Washingtonia filifera* in southern California by incorporating them within national monument bounds. A drawback has been the widely separate locations of the main stands, but from a botanical standpoint it is hoped that eventually some

arrangements can be perfected whereby some of these palms can be placed under Government protection.

To this end Representative William Kettner, of California, introduced in Congress, January 15, 1920, a bill (H. R. 11733) "making reservation and withdrawing from settlement, occupancy, or sale and dedicating and setting apart as a national monument a certain tract of land in the county of Riverside, Calif." This proposed monument includes the famous grove of palms in Palm Springs Canyon, about 50 miles from Riverside. It appears, however, that nearly all of the lands are privately owned or the Indians of the region have acquired vested interest therein and that, as far as these lands are concerned, it would be necessary to obtain the full and free consent of the Indians to the disposition of the lands at a price to be agreed upon.

It is to be hoped that some arrangements can be made to purchase the Indian lands, as well as the other private lands, possibly by private contribution, for this region, with its groves of palms and other desert flora, is worthy of preservation as a national monument.

BRYCE CANYON, NATURE'S MASTERPIECE OF COLOR.

A particularly fascinating opportunity for a national monument is given by the wonderful formations included in the so-called Bryce Canyon in southern Utah. In company with Inspector Herbert W. Gleason, of the department, I visited this area during the latter part of November, 1919, and can emphatically pronounce it as worthy of that distinction. Inspector Gleason, in his clear description of that area, says:

Bryce Canyon is on the eastern declivity of the Paunsaunt Plateau (altitude 8,000 feet) about 25 miles southeast of Panguitch. It is reached by a road which leaves the main highway 7 miles south of Panguitch and is, for the most part, an excellent road for automobile travel. Immediately after crossing the Sevier Valley the road enters Red Canyon, and for a few miles there is a display of dazzling color and weird formation. This canyon alone is worth a long trip to see, and if it were in the neighborhood of some large eastern city, it would be accounted one of the wonders of the world. Beautiful as it is, however, it hardly does more than suggest the revelation of beauty which lies farther on. Leaving Red Canyon, the road climbs up on the plateau and traverses a semiarid region, dotted with sagebrush and scrub pine, with never a hint as to what is coming, when suddenly the road comes to an abrupt stop on the very brink of a vast amphitheater, which has been eroded in the plateau—an amphitheater a thousand feet deep, filled with the most amazing array of pinnacles, shafts, columns, and temples, with endless variety of sculpture and ornament, and all exhibiting a range and intensity of coloring which is almost overwhelming * * * photographs are pitifully inadequate as attempts to reproduce anything of the real glory of the canyon. They merely suggest—and that imperfectly—the extent and variety of the rocky formations. Even the skill of the most consummate artist, aided by the most perfect palette of colors, would not suffice to give more than an impression of the scene. The reality is beyond human reproduction.

The chief agent, however, in bringing out the glory of Bryce Canyon is the sunlight, and it is a fascinating spectacle to watch the play of sunlight and shadow among the colonnades and pinnacles. Under favorable conditions a novel and very charming illusion appears. Some of the pinnacles seem to be translucent and take on an alabaster character. This is due, apparently, to the reflection of the sunlight from the south face of one row of pinnacles against the north face of an opposing row. It is an exquisite effect.

HOW TO REACH BRYCE CANYON.

Already the canyon's fame has spread, and this year motor stage service from Marysville, Utah, on the Denver & Rio Grande Railroad,

to Bryce Canyon and the north rim of the Grand Canyon has been established. A motor stage service from Lund, Utah, on the Los Angeles & Salt Lake Railroad, including Zion National Park, Bryce Canyon, and the north rim of the Grand Canyon National Park, is also available. Plans are being considered by the railroads and stage operators to combine these trips in a circle tour.

Senator Smoot, on November 3, 1919, introduced a bill in Congress for the purpose of constituting this area a national park, but from many accounts regarding that region it is believed that a more detailed exploration may find other localities within this general section that possess equal interest with Bryce Canyon and should be included within the scope of the bill. It is certain that here in southern Utah are some of the Nation's most beautiful and wonderful works of nature. Certainly they are the best exhibits of nature's coloring of the materials of the earth. It will be the policy of this service to do all in its power to bring the American people to a full appreciation of what that scenic region holds for their benefit and pleasure.

NOT ALL PARK AND MONUMENT AREAS ADMINISTERED BY OUR SERVICE.

It is not generally known that, in addition to the 24 national monuments under the jurisdiction and control of the National Park Service, there are also 10 national monuments within national forest boundaries administered by the Forest Service of the Department of Agriculture, and 2 within the confines of military reservations. Surprise is often expressed at this anomaly. There is no logical reason why these should not be turned over to the service as part of a well-coordinated national monument system; in fact, there is every reason why they should be administered and controlled by the service. The National Park Service was created for the express purpose of administering and developing, under the direction of Congress, all the great scenic attractions on national domain, and the most impressive and spectacular of these areas have already been turned over to its jurisdiction. The impelling force and enthusiasm with which the traveling public have availed themselves of the attractions offered by our national park and monument system makes it evident that we must neglect no opportunity to develop all national monuments as accents of the highest interest along our great scenic routes, and arrange for their ready accessibility to the traveling public. A few years more and the extensive road development planned for the West will see a motor travel that will demand a glimpse of these historic and scenic exhibits, and necessitate extensions of feeders from the great Park-to-Park Highway to them. Travel to such monuments as the Petrified Forest, to Casa Grande, and the Tumacacori Mission, for instance, already surpasses the most sanguine expectations.

In my preceding annual reports I have repeatedly emphasized the great desirability of including these other monuments under the administrative control of the park service, and I hope the day is not far distant when this will be accomplished. This is also the case with the reservation created to safeguard Lincoln's birthplace, now under the control of the War Department. The park service is equipped to administer the additional national monuments, and with very little

expansion can manage the additional parks now controlled by the War Department.

Reference is made to the chart opposite showing the division in the control of all our national parks and monuments.

CIVIL ENGINEERING DEPARTMENT.

For a short time the service maintained a temporary general engineering and field office at Denver, Colo., with Civil Engineer George E. Goodwin in charge, in order to facilitate the exercise of engineering oversight and review of general engineering and construction activities in the different parks. Due to a lack of funds for renting suitable quarters and to the further fact that Engineer Goodwin was detailed to act as superintendent of Glacier National Park, the temporary office was closed on the ending of the last fiscal year. In this short period it was demonstrated, however, that such centralization of engineering activities was desirable in our field administration. General assistance can be furnished the park superintendents on purchases, specifications, and engineering oversight much more effectively and quickly than is now the case. Other bureaus of the department have already established field offices in the West; and if enlarged appropriations for park construction, improvements, and maintenance necessitate a larger engineering force, the establishment of such an office will undoubtedly be an absolute necessity.

IMPORTANT WORK ACCOMPLISHED.

During the past year the civil engineering department has been engaged principally in planning road and trail extensions and other improvements for the different parks. This department is charged with the formulation of plans for all general engineering projects and their preparation for final approval by the service and Congress. In many instances the engineering work itself is carried to completion under the direction of the civil engineer.

Due to the fact that Congress did not appropriate funds for any new road construction work in the parks, the engineer the past year was able to supervise construction of several improvement projects, but in the main devoted his time to the gathering of data and preparation of plans and specifications for present and future operations.

Some of the work accomplished consisted of the completion of the construction of the Marble Fork Bridge in Sequoia National Park; the completion of the survey and an estimate for a road from Happy Island, over Forsythe Pass, to Lake Tenaya in Yosemite National Park; the preparation of estimates and specifications for paving in Crater Lake National Park; the completion of estimates and specifications for the construction of the Carbon River Road in Mount Rainier National Park; the estimates and specifications for paving the Hermit Rest Rim Road; examination and estimates for a new rim road from El Tovar to Desert View, a reconnoissance and estimate for a trail from the south rim of Grand Canyon to the Colorado River, and the drawings and specifications for a suspension bridge for horseback travel across the Colorado River, all in Grand Canyon National Park; preparation of estimates and specifications for pavement of roads in Yellowstone Park; the preparation of estimates and speci-

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cations and the letting of the contract and beginning of construction of a concrete arch bridge across the Middle Fork of Flathead River near Belton, also completion of surveys of the Two Medicine Road and surveys for the improvement of other roads and the location of several trails in Glacier National Park; examination and estimates for two roads in Mesa Verde National Park; and survey and estimates for a 10-mile road to extend the present Elk Park Road to Giant Forest in Sequoia National Park.

MAJOR ROAD PROJECTS SHOULD BE STARTED.

Several important road projects should be undertaken in the immediate future. The Carbon River Road, in Mount Rainier National Park, will provide an entrance into the northwestern part of the park, giving the visitor an opportunity to see the interesting Carbon Glacier, and will make Mount Rainier Park much nearer and more accessible for the residents of Tacoma and, especially, Seattle. The Sequoia road project will connect the State concrete highway now building to the entrance and will be the scenic route to Giant Forest, with famed Moro and Castle Rocks always in view. Upon completion of this road and utilizing the present Giant Forest Road, a system of one-way travel will be possible, allowing motorists to make the Giant Forest run in less time and with less danger. The transmountain road in Glacier National Park will, as I have stated, form an important link in the Park-to-Park Highway. The first section of this highway, from the foot of Lake McDonald to the head of Lake McDonald, should be undertaken early next year. It will give motorists who visit the west entrance of the park an opportunity to drive along the shore of beautiful Lake McDonald direct to Glacier Hotel and to the settlement at the head of the lake. In Rocky Mountain Park we should build about 4 miles of "trail road," which is the first link in a sky-line boulevard that will command an unsurpassed view of miles of the Colorado wonderful mountain country and, which in general, will follow the old Ute Indian trail. In Yosemite National Park and in Yellowstone National Park the first work on the permanent paving projects should be commenced, paving first those roads having very heavy travel which are especially difficult to maintain. We should also undertake the paving to double width of the El Tovar-Hermits Rest Rim Road at the Grand Canyon, to make it available for motor travel throughout the entire year, and also begin the construction of a rim road from El Tovar toward Desert View, which, when completed, will give the traveler a magnificent drive along the south rim of the Grand Canyon for a distance of about 40 miles. These road projects are, of course, dependent on the appropriations granted by Congress.

TRAILS TO BE DEVELOPED.

Supplementing the road systems already constructed and proposed for construction, and the trail systems already built, a number of new trails are to be built in the different national parks which will enable the horseback and foot tourists to visit some of the more rugged and less inaccessible places that would be impracticable to develop by roads. In fact, in our park development consideration is

always given as to what parts of the parks could be better served by trail than by road, and these trails, when constructed, are so located and built as to give the travelers the best scenery with the least effort without defacing the topography or detracting from the natural beauty of the country through which it passes. The horseback and foot travel this season in the parks, and especially in Glacier National Park, has demonstrated the necessity for more trails for equestrians and pedestrians, and comprehensive studies will be made by the engineering department in planning such trails as will properly supplement the road systems and permit their fullest utilization and benefit by the people.

STANDARD DESIGNS AND SPECIFICATIONS.

Standard designs have been worked up and drawings made for rustic log bridges from 12 to 90 foot span lengths; designs and drawings have been made for timber culverts of several standard sizes and for corrugated metal culverts of various standard sizes, both with and without concrete head walls, and for concrete arch culverts of standard widths. Standard specifications have also been prepared for purchasing all classes of construction equipment and machinery, camp equipment, and miscellaneous supplies, and for miscellaneous small tools. Drawings have been made for standard ranger cabins and administrative buildings in Glacier Park, and in addition the civil engineering department has reviewed plans and estimates of proposed work in different parks and has made engineering studies and reports on various conditions affecting the different parks. More would have been completed in this respect had it not been for the fact that the removal of the former superintendent of Glacier National Park necessitated the temporary detail of Civil Engineer Goodwin as acting superintendent of the park. In addition to looking after the administrative and other work in connection with Glacier Park, Mr. Goodwin has, since his incumbency as acting superintendent of Glacier Park, acted as engineer with respect to general engineering projects in the other parks.

FORCE SHOULD BE INCREASED.

I feel that the accomplishments of the civil engineering department in inspecting the parks for the purpose of planning necessary engineering improvements and supervising the execution of those improvements in cooperation with the various superintendents has placed that department among the most important of our varied field activities. With the additional engineering work that must be undertaken to bring our parks to their fullest development in each individual case, this department will be exceedingly busy with its manifold problems, and enlargement of the present small force will be absolutely necessary.

LANDSCAPE ENGINEERING DEPARTMENT.

The establishment in 1918 of the landscape engineering department has been fully justified by the excellent results achieved by our landscape engineer, Charles P. Punchard, jr. The demands for expert advice on landscape problems, however, became so insistent from many directions that it was practically impossible many times during

the year to give immediate attention and the proper amount of study and thought to many of the problems presented. To relieve the pressure and expedite the work I secured the services of Daniel R. Hull, of Milwaukee, Wis., as assistant landscape engineer, Mr. Hull entering on his duties on August 1.

VARIED PROBLEMS.

It is not exaggeration to state that probably nowhere else in the field of landscape engineering is a more varied assortment of problems confronting the professional engineer to be found than in the National Park Service. Not only are there ever-recurring general problems involving vista cutting, cleaning up of down timber and brush along roadsides, and the general elimination of dead timber, location of trails, roads, bridges, and the structures of the administrative and cooperative units in the parks that must be considered in cooperation with the engineering department, but problems in town planning and community development, housing, and forestry. With the best of technical training as a necessary basis, success depends also upon a clear and practical understanding and appreciation of the relation of these varied problems to the limitations of existing appropriations. This in no wise means a compromise with ideals, but simply getting the best possible results out of every situation. It has been interesting to observe that as much effort has been expended in advising what not to do as upon what to do.

The large area covered by our parks and their relative distances from each other make it a difficult matter to cover all of them thoroughly during the year. Attention must be centered where it is most needed, and as the urgency of special problems requires. Mr. Punchard spent considerable time in the Rocky Mountain, Sequoia, Crater Lake, Mount Rainier, Yosemite, Mesa Verde, Grand Canyon, and Yellowstone National Parks and in the Muir Woods National Monument. The assistant landscape engineer, at this writing, is just completing an inspection trip into Mount Rainier, Glacier, and Yellowstone National Parks.

In all cases the problems have been solved with good judgment and skill. Despite our unfortunate position in working with war-time appropriations in times of peace, many important things have been accomplished. Vistas have been opened, exposing delightful landscapes theretofore unknown to the public. In the location and design of all buildings erected for the National Park Service—ranger stations, residences, entrance gateways, various administration buildings—the landscape engineer's advice was followed. It is a rule that no structure of importance, whether for the service or for the public operators, be erected until the approval of the landscape engineer has been secured on both location and design. Detailed attention was also given to possibilities of scenic development from a landscape standpoint, including adjustments of existing roads and trails to bring other points of interest within reach of the tourist, planning of additional free public camping grounds, and the like.

ADMINISTRATIVE GROUPS.

The development of proper administrative groups within the parks was studied, having in view a definite relation and functioning of

the industrial phases of these activities as part of a well coordinated whole. Such superintendents as have not already reserved certain spaces within their parks for this purpose have been requested to make arrangements for a definite arrangement of all administrative buildings as a unit. A complete administrative group would include such structures as stables, wagon and equipment sheds, garage, machine, blacksmith, electrical, paint, plumbing, and carpenter shops, and warehouses. Where a permanent camp is maintained at headquarters for housing and feeding laborers employed on park work, these buildings should be included in the general scheme. Lack of such coordination results in loss of time and energy in administration, and the use of scattered buildings has no status in the efficient operation of such a plan. A few of our parks are excellently arranged in this regard. Some have structures already built which can be converted for such use; others have, through the pressure of necessity and in the absence of skilled advice, gradually developed or have under development a group of service buildings; while others are working under the disadvantage of scattered buildings, inadequate in size and poorly located. All these conditions are being studied with a view to their coordination for most effective administration.

Perhaps the major portion of improvements in the parks during the past year has been the result of the efforts of the public operators themselves and in cooperation with them. In fact, it is in connection with the location and design of all new structures by these operators, and their harmonious relation to existing structures and the landscape, that the landscape engineering department fulfills one of its most important functions.

COOPERATION WITH PUBLIC UTILITY OPERATORS.

Due to the unusual activities of the past season, extraordinary demands for enlargements and improvements have been made upon the hotel and camp operators. These demands, coupled with the fact that in the majority of the parks only the summer season, which is also the tourist season, is available for new construction work, have made it necessary in some instances to approve the erection of temporary buildings and the installation of temporary housing and sanitary facilities in order to provide needed accommodations and comforts for the tourists. It is not our policy to approve temporary structures in the parks, and these variations from the general rule were permitted solely with the definite understanding that all of them were to be replaced as soon as possible with similar buildings and facilities of a permanent nature and on locations designated for the purpose by the landscape engineer, in accordance with a preconceived plan of development. It has been a source of gratification to me that in all cases our public operators have shown the utmost cooperation with our landscape engineer and full appreciation of the value of the professional advice and criticism available for them.

All future work and improvements undertaken by both the service and the public operators must be based upon the organized scheme of development so as to avoid mistakes in location and design which the service inherited at the time of its creation by Congress and assumption of jurisdiction and control over the parks. The im-

portance of intelligent, well-prepared plans for submission to the landscape engineer has repeatedly been emphasized, and in some instances drawings not clear and complete had to be returned for the submission of more comprehensible ones.

WORK IN THE PARKS.

In the Yosemite, Mr. Punchard spent about half a year in the study and execution of the development plans of the Yosemite National Park Co. for their extensive building program, to have them conform to the national-park requirements. The complete reorganization of this company and the preparation of its extensive building program demanded frequent consultations with their officials, both in San Francisco and the valley. The definite location of their entire layout, with relation to present and contemplated park improvements, involved a great deal of time and study. Important structures that were placed during the summer were a garage and repair shop to care for the summer's tourist travel, centrally located, well hidden, and of a type of architecture in keeping with the other buildings of the company and with the surroundings. Sixty-five new cabins were erected at Yosemite Lodge for the accommodation of the tourists, containing 100 rooms, all built and located in accordance with a general plan for the rearrangement of this camp. The further developments by this company, including the construction of a large hotel, have all been carefully reviewed by Mr. Punchard and received his approval. The Yosemite village scheme, a park project, was studied during the winter, and a well-organized plan for the development of the area, including commercial, industrial, and residential zones, has been formulated and will be adhered to.

In the Mount Rainier Park the plans for future buildings to be constructed at Paradise Valley for the accommodation of the rapidly increasing tourist travel were approved by the landscape engineer and the locations selected. A new wing to the Paradise Inn has been constructed, and mention is made concerning it on page 130. Plans for the development of an administrative group at Longmire Springs have also been prepared.

The camping situation in some of the parks, notably Sequoia, has developed to a point where it is becoming a problem to preserve the natural conditions and at the same time provide accommodations for the tourist. The tendency for people to congregate is natural, but this results in taxing available spaces to the limit. Particular attention was therefore given in the various parks visited to the expansion of camping facilities, extension of water supplies for the campers, and like conveniences. A general survey of conditions disclosed many small problems in improvements which are being solved to bring the standard of accommodations and appearances up to the level which the service is endeavoring to maintain. For instance, in the Sequoia Park the old post-office building has been covered with bark and painted to harmonize with the general situation.

In the Rocky Mountain Park the site in the village of Estes Park offered for the administration buildings of the service was inspected and tentative sketches for development made. The problems of housing park employees and the location and housing of park equip-

ment necessary for improvement work, and related questions of this nature, were also reviewed. In fact, these features of park development are practically the same in every park and form a very interesting detail of the landscape engineering department's studies.

In the Grand Canyon, one of our recent acquisitions to the national-park family, the landscape engineer found a certain degree of refinement and success in the design and location of structures already on the ground. The character of the building that was done under the direction of the railroad company and the Fred Harvey Co. was interesting and commendable. However, some unpleasant situations as to locations of structures exist, but these can be readjusted in the practical development of our administration buildings. Already a new warehouse, an office building, and a stable have been constructed for the service, which are simple in design and capable of proper expansion. The office building was erected on a site which will later be developed as a colony for the homes of the employees of the service, and the building was planned with this conversion in mind. A future site for an administration building has been selected with great care, and a general plan worked out for the development of an industrial group on an area sufficiently far removed from the other activities so as to be of the greatest possible efficiency and still bear a harmonious and definite relation to them. Suggestions regarding developments of free public automobile grounds and other important intimate subjects were carried out successfully.

In the Yellowstone the results of the landscape engineer's recommendations have been quite marked. Although many of them were of a minor nature, all had a direct bearing on each other and the whole, and obviously their continuance will eventually knit the whole ensemble into a harmonious whole, eliminating many of the unpleasant conditions which we have inherited. At important centers in the park attractive filling stations have been erected which are unique in this field of automobile service and deserve the highest commendation from a designer's standpoint. Constructed of logs and stone, and located with particular consideration of their relation to the surroundings, they have been the subject of much favorable comment. Sketches for the new ranger stations and other small service buildings will insure buildings of dignified and pleasing aspect. Preparations for enlargement and expansion of the camping facilities provided by the Yellowstone Park Camps Co. were carried on with the advice of the landscape engineer on location and design of the various details involved and proved eminently satisfactory. In fact, the plans of various operators in the park for additions and extensions to their accommodations were passed on and in their completion added greatly to the attractiveness of the different groups.

STANDARD PARK SIGN ADOPTED.

Special attention was given to the question of a standard sign for all the parks. The result was the adoption of a metallic sign, with white field and green letters, of such sizes and proportions that it would be easily and quickly read, and which also will be indestructible. These signs are to be mounted on posts instead of being affixed to growing trees. A system of insignia, to be worn on the uniforms

of the members of the various branches of the administrative and protective divisions of the parks, was developed during the year and put into effect.

OPPORTUNITIES FOR OUR RANGERS.

One particular activity not yet extensively undertaken by the service in the study and care of diseased and mutilated parts of growing trees is tree surgery. This method of saving particularly desirable specimens of trees has met with remarkable success throughout the country in recent years, and the possibilities for its application to some of the wonderful tree life in our parks holds the greatest interest and promise. One instance of special study of this subject by one of our rangers has been particularly emphasized by the landscape engineer as deserving of special attention to indicate the possibilities of a larger use of some of our rangers. This ranger took a course in tree surgery, and during the summer season occupied his spare time in experimenting with the wounds in trees in the immediate vicinity of his station. The results obtained were of the highest character and would compare favorably with similar work by professionals. Special work of this kind among our rangers not only will be a profitable line of expansion for them but suggests that there are other lines, such as taxidermy, forestry, surveying, and drafting, which are in everyday use in our parks for which they can develop themselves and increase the already high standard of personnel of the ranger forces.

The preceding paragraphs covering the activities of the landscape department for lack of space only touch briefly on the most important operations and recommendations. A detailed analysis of the work done and to be done is contained in the report of the landscape engineer on pages 331 to 339. It is obvious, however, that our small landscape force is as great a factor in the harmonious development of our park improvements and the safeguarding of the parks in their natural condition as is to be found under the park service.

THE YEAR IN THE PARKS.

The following summary of conditions in the parks and monuments during the past year, their improvement, needs, and the plans for their early future development and improvement is purposely made brief in view of the very comprehensive reports of the superintendents and custodians, which have been printed in full in Appendix B.

YELLOWSTONE NATIONAL PARK.

This has been a critical year in the history of Yellowstone National Park. This statement comprehends a repetition of what has already been said about the irrigation schemes which have struck at the very heart of the park, and also includes the mention of the loss of wild animals, principally elk and deer, by slaughter and starvation in a winter almost unprecedented. But the year brought other crises of less moment, probably, but nevertheless important. For instance, heavy travel taxed the hotel and camp accommodations to their utmost capacity, and there appears to be no practicable means of ex-

tending these facilities materially before the opening of another season. Scarcity of labor, extraordinarily high prices, and unfavorable weather combined to interfere with and seriously delay necessary advancement. Again, the sprinkling system of the park, an old establishment, has suddenly gone to pieces under constant usage without essential renewals that would have been installed as needed had funds been available; also the demand for public camp grounds with necessary sanitary facilities has kept this year far ahead of our ability to construct such accommodations. These and other unexpected happenings have given the park management an enormous amount of additional duties to perform, which have taxed the time and health of the force to an extreme limit.

THE PARK'S MOST SUCCESSFUL SEASON.

However, we have gratifying events and results to compensate for the unusual worries and physical strain suffered. The elk and other wild animals were saved from nearly complete extermination, the irrigation projects have been stopped by your determined stand that the Yellowstone and all other parks must be preserved in their natural state, 80,000 visitors were cared for with scarcely any dissatisfaction or complaint, the roads were in superb condition throughout the summer, and the trails were vastly improved. Moreover, under favorable weather conditions camping and fishing opportunities were unexcelled and were enjoyed to the fullest extent. The weather, too, was responsible for a display of wild flowers and grasses that made the park a veritable paradise from June until late September. Abundant ground water is probably the reason for greater activity on the part of many wonderful hot springs and geysers, just as it nurtured the wild-flower exhibits from the lowest valleys to the highest peaks.

THE IRRIGATION SCHEMES.

In the earlier part of this report I briefly covered the plans under way to utilize the park waters for irrigation purposes. Some details are in order here.

THE FALLS RIVER BASIN PLAN.

The scheme that has been advanced nearest to complete success is the Idaho project to use for an irrigation reservoir what has been erroneously called the Falls River Basin in the southwest corner of the park. This area really comprehends several basins that run back into the fine wooded canyons of the Pitchstone and Madison Plateaus. The principal basins are those of Bechler River, Mountain Ash Creek, and Falls River. By the construction of two dams it is proposed to flood all three of these basins and several smaller ones, backing the water up to the very cliffs of the plateaus, cutting off access to the valleys and canyons above, leaving unprotected all of the park southwest of Upper Geyser Basin and Shoshone Lake, and destroying between 8,000 and 10,000 acres of fine meadow and timberland. The water to be stored in these reservoirs it is proposed to use in Idaho.

BILLS IN CONGRESS.

This project was not formally presented to the department until the middle of last winter. No member of the National Park Service, except a few rangers, had ever visited this corner of the park. An investigation would have been made last autumn, but early storms cut off access to the region. When the plans were submitted to the department I pleaded for time in which to study the scheme on the ground, and contended that in the absence of a favorable report by the National Park Service the project should be unfavorably considered or action postponed until the country could be examined. This contention the Idaho promoters agreed to, but immediately sought action in other quarters. The result was the introduction of bills⁷ (Senate bill No. 3895 and House bill No. 12466) by Senator Nugent and Representative Smith, which the department on March 6, 1920, indorsed. On April 6 the Senate passed the bill, but in the House your vigorous letter of April 15, 1920, to Majority Leader Mondell discouraged action, and held the measure up for public scrutiny. An attempt was made to tack the bill to the sundry civil bill as a rider, but the chairman of the appropriations committee objected. Next an effort was made to have a special rule approved which would call for action on the bill after one hour's debate. A hearing was held by the rules committee on May 27, and another letter by you, combined with testimony by representatives of several organizations that stand for the preservation of the parks, as well as gentlemen speaking only of their own convictions, convinced the committee that haste in the passage of the pending measure was inadvisable. The bill still stands on the calendar.

THE CASCADE CORNER OF THE PARK.

Recently two thorough investigations of the southwest corner of the park have been made, one by Mr. Wm. C. Gregg, a manufacturer of Hackensack, N. J., the other by the superintendent of the park. Mr. Gregg spent three weeks in the region, making what are probably the first photographs of that section. He found that practically every statement made by the irrigation proponents regarding the nature of the country was not in accordance with the facts. Instead of an unsightly swamp, as was claimed, he found beautiful, firm meadows and large, clean forests of pines and spruces. Back of these meadows he found more than 40 waterfalls and cascades, many of them approaching in size and beauty the Great Falls of the Yellowstone in the Grand Canyon. A picture of an unnamed fall of great height and beauty is shown in this report. Mr. Gregg believes this section of the park is destined to become the most popular camp ground of the park. All that Mr. Gregg says of this country Superintendent Albright corroborates since he completed his subsequent studies.

Both Mr. Gregg and the superintendent independently located reservoir sites outside the park on Dog Creek, on Boone Creek, and in Winegar Hole where an abundance of water could be stored, but probably at greater expense than in the park.

⁷ See reports on this legislation in Appendix D, pp. 379-387.

THE YELLOWSTONE LAKE PROJECTS.

Two States have designs on Lake Yellowstone, one of the principal features of the park and noted as one of the most beautiful bodies of water in the world. Idaho irrigation promoters want to store water behind a dam to be erected at the outlet of the lake and take this surplus water, through tunnels to be cut under the Continental Divide, and turn it into the Snake River, taking it then to Idaho lands.

On the other hand, a Montana project contemplates the same storage of water for the benefit of lands in the watershed of the Yellowstone River. At first the promoters of the two projects were inclined to quarrel, but lately they have suggested that they combine their energies and divide the spoils. Of course this means installing a dam at least twice as high as each one has separately advocated, and therein lies the greatest danger to the park, aside from the precedent that would be established. Should one group of promoters secure the privilege of damming the Yellowstone it would be a logical thing, for the benefit of others, to increase the height of this dam to the limit of the dam site, which is 25 feet.

Such a dam would submerge 9,000 acres of land around Lake Yellowstone, of which 4,000 are timber land, 3,400 meadow land and moose-grazing areas, and 900 acres present beach. Some burned-over land would also be submerged, about 4 miles of the road system would be destroyed, and the hot springs at the Thumb would be flooded, as well as the most attractive islands.

THE GREAT FALLS IN DANGER.

The Idaho project would certainly impair seriously the beauty of the falls, besides ruining Heart Lake and tearing away the shores of the Snake River, both inside and outside of the park. The tunnels, too, would be unsightly. The Montana project, which, like the Idaho plan, claims to contemplate only the storage of water to the seasonal high-water mark, might or might not injure the falls and Grand Canyon, depending upon the season and upon the need for water. It can not be said that either project, if carried only to the extent of storing water to the high-water mark, would do more damage to the lake shore than possibly covering some meadow land and undermining a few stretches of road, but the point is the falls would be affected, and the precedent would be established for the raising of the dam to its ultimate limit, if any dam at all is allowed by Congress.

MONTANA'S CLAIMS AND THEIR MERITS.

Montana promoters claim, first, that the dam must be established at the outlet of Lake Yellowstone in order to control flood waters that damage farm lands in the eastern and southern part of the State, and, second, that they must have more water for irrigation. The answer to the first claim is that the flood waters do not come from Lake Yellowstone, but from a multitude of other streams, large and small, such as the big Lamar River, the Gardiner, the Stillwater, the Boulder, Bear Creek, and their hundreds of tributaries, while Lake Yellowstone, because of its great size and small outlet, holds

its flood waters until late in the summer. The flood waters "drip," so to speak, from the lake, just as water would slowly drain from a nail hole in a large bucket. Lake Yellowstone is now a great natural reservoir constantly serving Montana alone. As no surveys and flow statistics are available, it is impossible to prove much by figures, but the above statement can be verified by personal observation. Statistics are not required.

OTHER IRRIGATION PLANS.

Other Idaho projects contemplate the use of Shoshone and Lewis Lakes, ranking in size as second and third lakes of the park, respectively. These lakes lie in forests of unusual density and beauty, and any raising of the water levels in them would destroy vast areas of timber and create scenes more unsightly than the awful Jackson Lake desecration.

It is contemplated, too, to place dams in the outlets of Jenny and Leigh Lakes in the proposed extension of the park, beautiful lakes that mirror the Tetons, and acknowledged by world travelers to be absolutely unexcelled in beauty. These dams would raise the water levels sufficiently high to kill a wide fringe of timber and, when lowered in the summer, to leave miserable mud flats to greet the visitor.

None of these projects ought to be favored by Congress, because they point the way for the complete commercialization of the park. The "hands off" policy is the only safe one to pursue.

ELK HERDS SUFFER IN AWFUL WINTER.

In my last report I mentioned that the elk herds of the park were in danger. The prospects were that the winter would be severe and that food for the wild animals would be scarce because of the drought of the summer. These statements were written about the 1st of October, 1919, and before the month was over one of the worst storms in the history of Yellowstone Park covered mountains and valleys deep with snow and drove thousands of elk and deer beyond the park boundaries. The open season for elk in Montana began on October 15 and continued until Christmas day. A tremendous slaughter of elk took place, several thousand being shipped away on the Northern Pacific trains from Gardiner, and probably as many more were either killed and used in the region immediately north of the park or died from wounds received during the hunting season.

DEFICIENCY APPROPRIATION GRANTED.

Early in November, when it appeared that the storms would continue, and that there would be no opportunity for the elk to search for food in the open valleys of the park, we began the purchase of hay and the feeding of the same in an effort to keep some of the elk within the confines of the park. A few hundred tons that had been acquired in September, and some hay that was purchased the year before, were still available. However, all of these stocks of hay were used in a short time. Before spring 1,070 tons of hay had been purchased at prices ranging from \$25 to \$50 per ton, f. o. b. the north-

ern entrance. Much of this hay was purchased with the maintenance funds and it was necessary to secure a deficiency appropriation from Congress, which was granted in the general deficiency act of March 6, 1920.³ The amount of this appropriation for feeding the elk was \$38,058.59.

PUBLIC SUBSCRIPTIONS WIN THE BATTLE.

On the 1st of March it was believed that the hay available would carry the herds through, but during the latter part of the month and the earlier part of April more storms swept the park and the weather continued extremely cold. It was then that it became necessary to call for subscriptions for the purchase of enough hay to save the animals until spring should open their ranges. Public-spirited citizens and the American Red Star Animal Relief responded to our plea for help, with the result that \$4,703 was made available for the purchase of sufficient hay to meet the situation.

Altogether 1,429 tons of hay were fed to the northern herd, including the amount unused in the previous winter and the quantities fed from the native hay cut and stocked on Slough Creek in the northwestern portion of the park.

In the meantime the southern herd of elk had gone south to the Jackson Hole, where it was fed at the Elk Refuge, maintained by the Biological Survey in the Flat Creek Basin. Here 1,923 tons of hay were fed to the starving animals, 850 tons of which were raised on the Refuge, 573 tons purchased with funds which were later reimbursed to the Biological Survey in a deficiency appropriation, and 500 tons which were supplied by the State of Wyoming. Thus the total amount of hay fed to both herds of elk was 3,352 tons (1,429 to the northern herd and 1,923 tons to the southern herd) and the appropriations made to cover these purchases were \$38,058.59 for the northern herd and \$36,271.50 for the southern herd, exclusive of the amount expended by the State, to which should be added the fund of \$4,703 publicly subscribed.

DEPLETION OF THE HERDS.

When spring came, bringing the opportunity to estimate the losses in the herds, it was ascertained in several independent investigations that there were not over 13,000 head of elk left in either herd—probably not over 11,000 in the northern herd. Thus the great elk herds, which probably numbered as many as 50,000 in 1912, were reduced by the spring of 1920 to a little over 20,000. Of course, there are some elk belonging to the Yellowstone herds that range east of the park in the winter (and fortunately these herds are slightly increasing), but they, too, were reduced by hunters during the open season of last year.

Taking everything into consideration, therefore, the winter of 1919-20 was a terrible one for the wild life of the Yellowstone region, and it is doubtful whether the elk herds will survive more than one more such winter. Certainly without feeding they would not have survived last year.

We might as well face this fact squarely: The elk of the Yellowstone are not holding their own. Some means must be found for

³ See Appendix D. p. 367.

guaranteeing their protection in bad winters. The plan heretofore suggested by the Government bureaus which have studied the problem, namely, that hay ranches be purchased north of the park, and the elk ranch in the Jackson Hole extended, seems to be the solution.

WORKING AGAINST RECURRENCE OF LOSSES.

This year, however, the park management has cut over 300 tons of hay in the Slough Creek region, and with this hay it is hoped that the elk can be stopped on their fall migration and fed far back in the park, thus obviating the necessity for feeding inside the park boundary near Gardiner. It is probable that if hay could be made available all along the roads between the Blacktail Deer Creek and Slough Creek most of the northern herd could be kept in the park. However, the experiment of this winter will test the idea as to its practicability.

There are many details of the elk losses, as well as conditions of the other animals, which are covered fully in the superintendent's report. The recommendations made therein I heartily favor. One of the most important of these is that the open season for the killing of elk in Montana should be reduced from 75 days to a period of 2 weeks, or else, as suggested by Gov. Carey, of Wyoming, that the legislatures of the three States of Montana, Wyoming, and Idaho give to their governors the power to reduce the open season for the killing of both elk and deer to such period as the size of the herds, weather conditions, and other factors might make advisable. It should be made a matter of record that the game laws of the State of Montana are chiefly subject to criticism. They are not worthy of a civilized State. With the American game disappearing as fast as it is, it is shameful that elk can be killed during a period of 75 days, and deer in a 60-day season. Wyoming has a season perhaps longer than it should have, but that State has done much in the way of the establishment of game preserves, and has taken other protective steps to conserve its wild life. Along the Wyoming side of the park alone there are three great game preserves, the Hoodoo, Teton, and Shoshone preserves, while Montana maintains but one exceedingly small and wholly inadequate preserve along part of the northern line. As far as Idaho is concerned, under its game laws practically all of the elk that were accustomed to stray within the boundaries of the State have been killed.

THE EXTENSION BILL IN CONGRESS.

Aside from the irrigation bills, no other legislation regarding the park has been considered since the date of my last report. H. R. 1412, providing for the enlargement of the park, has not been brought up by the Public Lands Committees, but it is hoped that favorable action may be taken on this meritorious bill during the coming session of the Congress. There is still some opposition to the measure on the part of a few cattlemen of the Jackson Hole, who hope to obtain grazing rights in the extension region, even though it has never been open to the pasturage of live stock. The leaders of this group, it is understood, are not citizens of Wyoming.

While it may be possible to make some adjustments in the new boundary line proposed, the lines as drawn in the pending bill should not be substantially altered. There is no question but what all of the proposed addition lying west of the Tetons and north of Boone Creek should be eliminated, because within this area there are some reservoir sites that would meet the needs felt by Idaho farmers for more irrigation water, which now prompt them to seek privileges within the park itself.

NO ROADS IN THE EXTENSION.

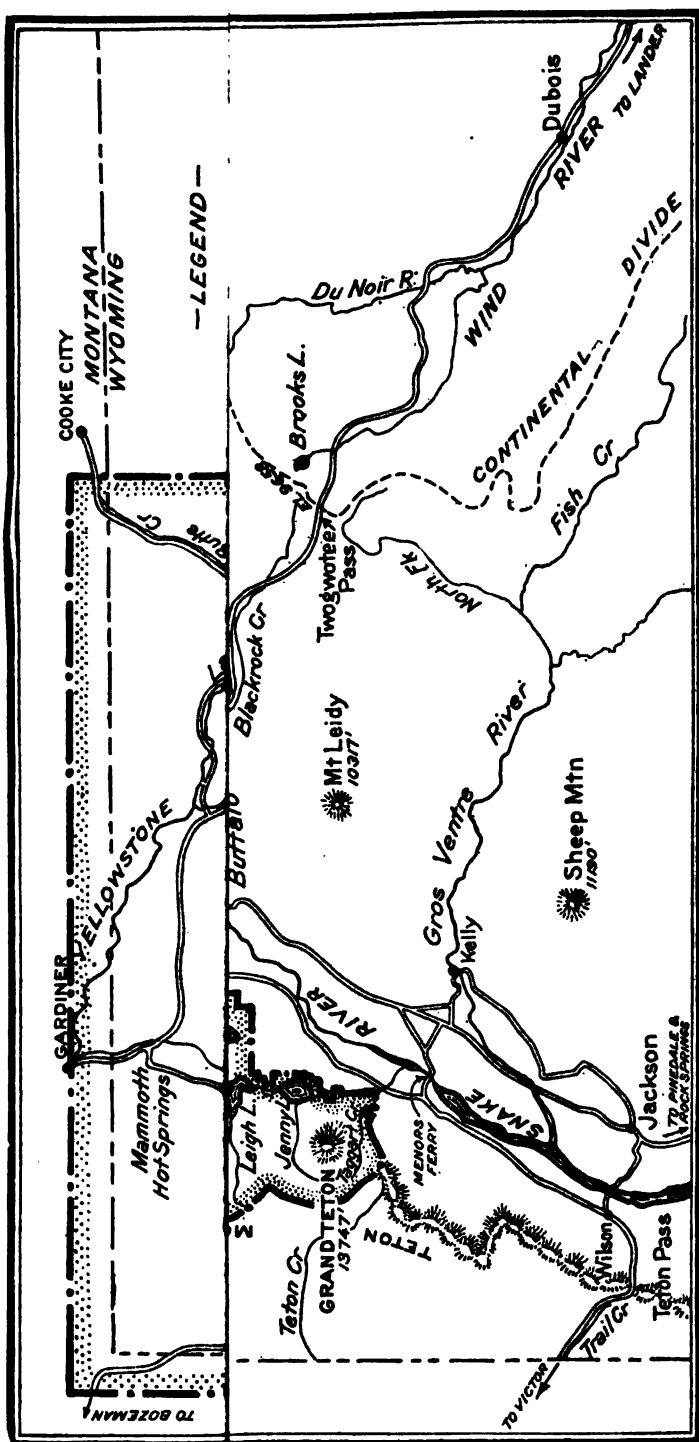
Should the extension of the park be approved, it would be the policy of this service to abstain from the construction or improvement of any more roads than now exist in the region. There are already nearly 400 miles of highway in the Yellowstone system, and these roads should be vastly improved before extensions are undertaken. Furthermore, it is my firm conviction that a part of the Yellowstone country should be maintained as a wilderness for the ever-increasing numbers of people who prefer to walk and ride over trails in a region abounding in wild life; also, I think a road around Lake Yellowstone or in the Upper Yellowstone and Thorofare country would mean the extinction of the moose. I am so sure that this view is correct that I would be glad to see an actual inhibition on new road building placed in the proposed extension bill, this proviso to declare that without the prior authority of Congress no new road project in this region should be undertaken.

Likewise, I feel that there should be no new roads along the base of the Absaroka Range in the eastern section of the park or into the high valleys of the north. Yellowstone is well provided with roads, but they should be very greatly improved, and as soon as possible a program of hard surfacing them should be undertaken.

SNOWPLOW OPENS ROADS.

The long, hard winter with its heavy snows, followed by a cold, backward spring, cast difficulties in the way of opening the park for the season that seemed well-nigh insurmountable. On the 10th of May it was impossible to move more than 4 miles south of headquarters at Mammoth Hot Springs. Huge drifts in the passes prevented the use of horses in opening the roads, but there were such great lengths of road to open that neither horses nor men could have accomplished the task in a month had money been available for their employment. There was no money to use on such a project. "Necessity, the mother of invention," finally pointed the way. A snowplow was constructed in the shops of the park by the master mechanic and placed in front of a 75-horsepower Holt caterpillar, with the idea of using the caterpillar to push the snow from the road. Contrary to predictions, the machine did exactly what was desired. A roadway 11 feet wide was cleared from headquarters to the Grand Canyon and Yellowstone Lake before June 1, and in plenty of time to permit necessary construction and repair work to be done on hotels and camps, as well as the rationing of them before the season opened.

The power snowplow also opened the Dunraven Pass Road earlier than it has ever been opened before. Sylvan Pass, however, had to



MAP SHOWING PROPOSED ENLARGEMENT OF YELLOWSTONE NATIONAL PARK AND DEVELOPMENT OF SOUTHERN ENTRANCE.

be shoveled out by crews of men employed by the National Park Service and the Cody business men. This pass was opened on June 17. It was impossible to take the caterpillar into Sylvan Pass on account of some defective bridges.

MAINTENANCE BY SECTION CREWS.

Going back to the system of road maintenance employed by the park's greatest engineer, Gen. Hiram Chittenden, the superintendent this year employed a score of section crews who, working with gravel wagons, kept the chuck holes filled up, repaired culverts, cleared away rocks, and performed other work that resulted in keeping the highways smooth. Over 100 miles of the road system were sprinkled twice a day.

This care of the roads, however, did not prevent deterioration, and it is a fact that at the close of the season the roads were almost worn out in many places. Such heavy traffic as they sustained this season can not be borne long without seriously injuring them. Many sections of the main system should be hard surfaced in the early future. Also, several new bridges should be installed, and parapets should be built for the protection of motor vehicles. All of the other road and trail improvements recommended by the superintendent in his report should be made at an early date.

TRAVEL UNUSUALLY HEAVY.

Nearly 80,000 people have visited Yellowstone since last year's report was issued. Of these, 50,000 came in private automobiles, and nearly 40,000 motorists brought their own equipment and camped out in the park, many of them spending long periods of time resting, fishing, and otherwise enjoying themselves. To care for the campers it was necessary to do something in the way of establishing camp grounds on a big scale, especially at Mammoth Hot Springs, Upper Geyser Basin, Grand Canyon, and Yellowstone Lake outlet. At the first three places mentioned, pure water was piped to the grounds selected, wood dragged in, comfort stations established, etc., but beyond the erection of comfort stations at Lake outlet nothing could be done on account of lack of funds.

One can estimate the problem of caring for these great camps when he considers that every night at the height of the season there were 900 to 1,200 people in each of these establishments, more than were housed in the near-by hotel and permanent camp combined. The garbage and sewage disposal problems are especially important, and there is no question but what modern sewer systems for all of these big camp grounds, as well as for the hotels and permanent camps, must be installed in the very early future.

COMMUNITY CENTERS FOR CAMPERS.

Following the establishment of these great automobile camps at the main centers of interest in the park, new ranger stations should be constructed. That these stations should contain large central rooms, to be maintained as information headquarters and community centers for campers, was the farsighted suggestion of Chairman Good, of the House Appropriation Committee. Plans have been

made for the erection of three such stations next year, one at Old Faithful, one at Lake outlet, and a third at Grand Canyon. At Mammoth Hot Springs the central information office and museum will serve the same purpose.

BETTER POSTAL FACILITIES NEEDED.

These buildings would also be available for branch post offices, which I believe should be established at once at Old Faithful, Lake outlet, and Grand Canyon. While the hotel and camp tourists have good mail service, the camper fares badly. Usually he has to go into Mammoth Hot Springs to get his mail because of the lack of branch offices, while the hotel and camp utilities look after their own patrons.

The Post Office Department should establish at least the three branches mentioned, and should transport mail to and from them in its own trucks. In brief, the system that has been installed this year in Yosemite Park should be extended to the Yellowstone. We now have a main post office and two branches within a mile of each other in Yosemite Park, and in the Yellowstone there are three great tourist centers, from 30 to 50 miles from the main office, and no branches at all.

BETTER COMMUNICATION SERVICE ALSO NEEDED.

While telephone and telegraph facilities have been improved this year, there is room for much greater betterment. The service ought to own and operate all wire lines; but if the hotel company is permitted to continue to operate its telegraph lines, an arrangement should be made with the Western Union whereby messages can also be sent and received by Government operators for tourists who do not patronize the hotels and permanent camps.

To improve the present park telephone system this year a double iron metallic circuit was installed between headquarters and Norris Junction, a distance of 20 miles. Improvements of this kind should be continued each year, but the advisable and economical thing to do would be to take over all the lines and build a first-class telephone system with as many wires as would be necessary to handle the business of the Government, the utilities, and the traveling public.

ACCOMMODATIONS TO BE ENLARGED.

Although the capacity of one hotel has been enlarged, and several permanent camps have been extended, there were several occasions during the past season when the demand for accommodations exceeded the supply. Likewise the transportation facilities were taxed beyond their capacity at the peak of the season, despite the fact that a large number of new cars were purchased.

Should the travel next year exceed that of the current season, and this is to be expected, the public utilities of the park may find themselves confronted by the necessity of making pretentious enlargements of their facilities for taking care of the public. This they are ready to do as finances, labor, and material can be procured. The transportation company is now negotiating for more cars, the hotel company is enlarging its dining-room facilities at Old Faithful, and

the camps company is extending both its housing and dining-room facilities at several camps.

Taking into consideration all the existing conditions affecting the operations of the park public utilities, they operated this year with more efficiency than I have ever before observed. Service generally was excellent, and it was especially gratifying to observe the care and protection given to patrons of the transportation company by its employees, almost all of whom respected and implicitly observed the rules of the service in regard to speeding and passing private motor vehicles on the park roads. Furthermore, nearly all of the drivers were courteous and sought to inform their passengers regarding the park and otherwise entertain them.

CAMP ROOSEVELT ENLARGED.

Camp Roosevelt, built near the site of Col. Roosevelt's camp in the spring of 1903, has lately been improved by the construction of a large log dining room and lounge. This will be followed by the erection of log cabins for sleeping accommodations. This resort is to be operated for those who come to the park to remain for awhile, fishing, walking, riding horseback, and enjoying other forms of healthful recreation. A boys' camp will be operated in connection with it.

New stores of pleasing architecture have been erected during the year at Lake Outlet and Grand Canyon, and attractive gasoline-filling stations have been constructed at Mammoth Hot Springs and Old Faithful.

Much landscape work has been carried on under the direction of the landscape engineer, the most ambitious project being the study of a town plan for West Yellowstone, outside the western gate, which is to be cut up and sold under the town-site laws.

FISH AND FISHING.

Yellowstone Park has always been famous for its fishing waters, but the immensely heavy increase in travel that the park has enjoyed during the past two years has seriously depleted the fish supply in several of the most accessible streams. To reestablish these streams and protect the park against further depletion, an extensive program of stocking barren streams and restocking other waters was undertaken during the past summer. Altogether 2,000,000 fry hatched in the Yellowstone Lake hatchery, operated by the Bureau of Fisheries, were planted in the park, and rainbow and eastern brook fingerlings to the number of 18,000 from the Bozeman hatchery were planted by the service in cooperation with the Bureau of Fisheries. There can be no doubt but what this fish planting achievement will very shortly redound greatly to the benefit of the park and to the enjoyment of its hundreds of streams and lakes by visiting tourists.

EXTRAORDINARY SERVICE BY LOYAL EMPLOYEES.

No statement regarding Yellowstone Park operations during the past year should be brought to a conclusion without a grateful acknowledgment of the self-sacrificing efforts of park employees, particularly those of the ranger force, who, in the face of tempera-

tures far below zero, worked to save the wild animals of the park, struggling against the elements in an unprecedented winter. That Yellowstone Park still stands as the Nation's greatest game preserve, and that elk and deer still range in that preserve in large numbers, are gratifying results that must be credited to the heroic efforts of loyal employees, whose interest in the park and its natural features is never measured by the financial emoluments of their positions.

YOSEMITE NATIONAL PARK.

It is a pleasure to be able to record each year that Yosemite National Park has completed its greatest and most successful season. Every season since my official connection with the national parks was formed Yosemite has exceeded all previous records of travel and has steadily forged ahead in improvements.

Only recently, while in the Yosemite Valley, I surveyed all of the achievements of the past five and one-half years, especially of the five seasons of Superintendent Lewis's incumbency, and as I compared the park of to-day with that of 1915 I realized as never before what a tremendous change in conditions had been wrought. All of these accomplishments have been in the public interest, and all have redounded, as made, to the pleasure of the park's patrons. That the people themselves have appreciated what has been done there is indicated plainly by the fact that ever-increasing throngs go to the park each summer, even though approach roads are bad and many of the roads within the park are often in a state of disrepair on account of shortage of funds.

POST-OFFICE FACILITIES VASTLY BETTERED.

During the past year the public utilities and the Government have both contributed largely to Yosemite's betterment and advancement. Not all of the Government's work by any means was performed by the National Park Service. The Post Office Department completely reorganized the postal service of the valley and improved it even beyond the expectations of all concerned in the management and operation of the park.

The Camp Curry post office was consolidated with the Yosemite office, which was advanced to the second class, on account of the combined business performed by the two old offices. Under the new system the Post Office Department established a main office at the village of Yosemite, and placed two branches in the valley, one at Camp Curry and one at Yosemite Lodge, all in charge of experienced officials and clerks.

Mail delivered at El Portal by the railroad was taken at once in trucks belonging to the Post Office Department to the Yosemite office for distribution. From there trucks were also used to move mail to and from the branches.

So well did the new system work that plans are now under consideration for an extension of the postal facilities to the big public automobile camps, the main idea contemplating the distribution and collection of the mail under an arrangement similar to the rural mail system.



A. BLUEBIRD LAKE IN THE WILD BASIN REGION.

Nearly a quarter million persons visited the park in 1920, yet only comparatively few visited beautiful Wild Basin, due to lack of roads and trails in this section.



B. THE ONE HE MISSED.

Attractive camping sites, fine fishing lakes, and easy accessibility from all large centers of population in the Middle West are the reasons for the tremendous popularity of the park.

ROCKY MOUNTAIN NATIONAL PARK.

Photographs by Mile High Photo Co., Denver.



Photograph by William C. Gregg.

A. UNNAMED FALLS 130 FEET HIGH IN FALLS RIVER DISTRICT.

Irrigationists seeking to gain irrigation easements in southwestern corner of park have declared it to be devoid of scenic beauty.

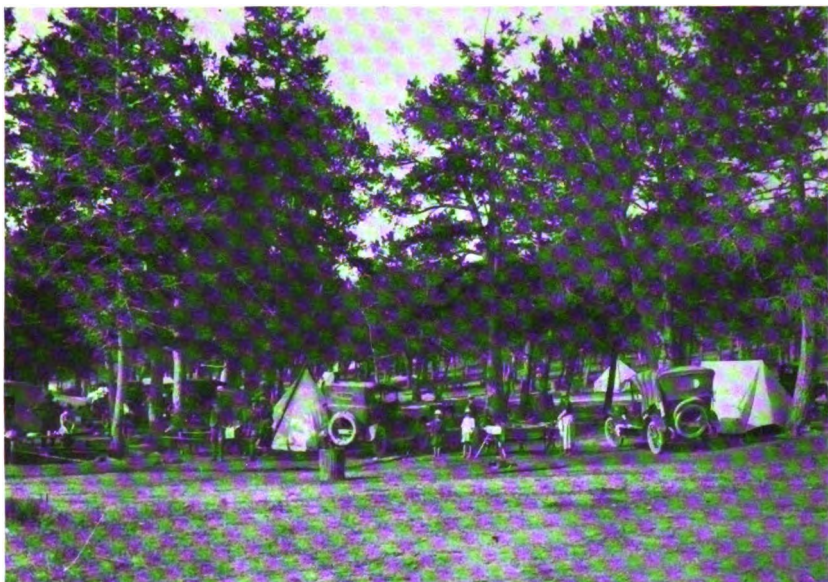


Photograph by Bert Stinnett.

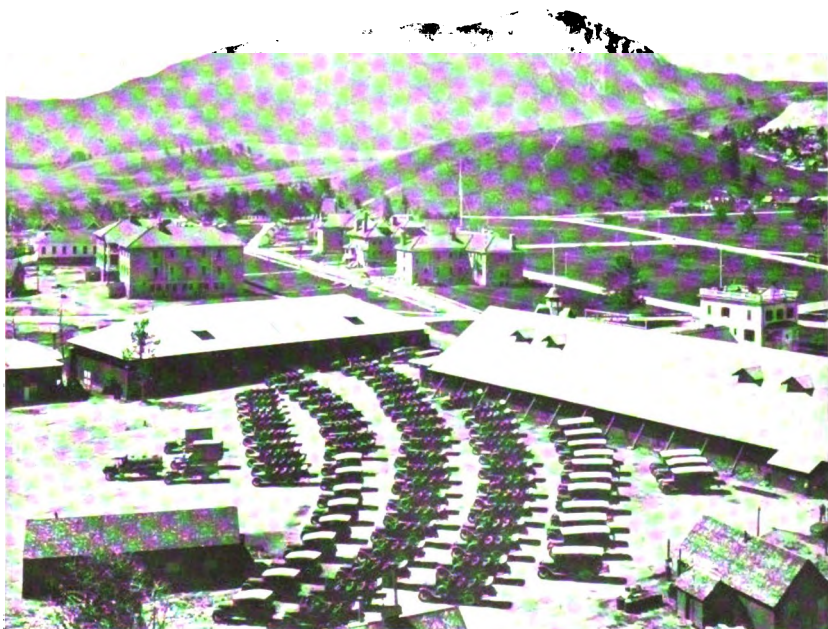
B. INNOVATION IN CLEARING PARK ROADS OF SNOW FOR 1920 SEASON.

A snowplow attached to a 75-horsepower Holt caterpillar by the park engineers performed valiant service.

YELLOWSTONE NATIONAL PARK.



A. CAMPING IN MAMMOTH HOT SPRINGS AUTOMOBILE CAMP.
As many as 300 cars were parked in this site in a single night during the 1920 season.



B. MOTOR EQUIPMENT OF YELLOWSTONE PARK TRANSPORTATION CO.
READY FOR OPENING OF 1920 SEASON.

It includes 124 ten-passenger cars, 21 seven-passenger cars, and 20 miscellaneous cars.

YELLOWSTONE NATIONAL PARK.

Photographs by J. E. Haynes.



Photograph by Fred H. Kiser.

A. HIKERS ON THE JOSEPHINE LAKE TRAIL.

Glacier is essentially a trail park and hiking is one of the most enjoyable sports in which practically everyone can indulge.



Photograph by T. J. Hileman.

B. SADDLE HORSE PARTY IN PIEGAN PASS.

There are more saddle horses used in Glacier Park than in any other similar recreational area in the world.

GLACIER NATIONAL PARK.

INTERDEPARTMENTAL COOPERATION.

This is a splendid example of comprehensive interdepartmental cooperation such as I have long desired to have aid the improvement of the parks.

Another case of similar cooperation has been the mosquito-control work and sanitation inspection by officers of the United States Public Health Service. Maj. J. C. Geiger, of the Public Health Service, had general supervision of mosquito control this year that was far more effective than any heretofore attempted. A further study of sanitation and water-supply problems was undertaken by Associate Sanitary Engineer Hommon, of the Public Health Service, and much valuable advice will be given to us by his forthcoming report.

SEWER SYSTEM UNDER WAY.

On the part of the National Park Service the most notable improvement work undertaken was the construction of a sewer system in Yosemite Valley, a main trunk sewer with treatment and disposal plant. Following this installation, however, there must be flush toilets placed in the public camps, and very soon a garbage incinerator should be built to take care of the enormous amount of garbage that now must be hauled to a pit and burned as best this can be done, a method that is growing harder each year to employ with any degree of satisfaction.

WATER SYSTEM WHOLLY INADEQUATE.

The increased use of water by the public utilities, the campers, and the service itself has brought us face to face with the necessity for developing a new supply. A possible source of supply is Illilouette Creek, above the old river intake, but it will require the expenditure of a considerable sum of money to construct the new system. Nevertheless it must be done in the very early future.

PUBLIC UTILITIES MAKE BIG EXTENSIONS.

The public utilities of the park on their part made very extensive improvements in their properties. The Yosemite National Park Co. erected a large garage and automobile repair establishment, and also a very attractive unit of wooden bungalows with bath facilities which became a part of its Yosemite Lodge. It increased other accommodations in Yosemite Lodge, and now has the means of supplying three types of sleeping rooms with board—wooden bungalows with bath, wooden bungalows without bath, and tents. The Sentinel Hotel is to be improved now by the addition of facilities for making the place more comfortable for winter occupancy, but most of the new things will be movable, and will be used later in the new hotel that it is proposed to build soon.

It is a source of deep regret to me that other demands upon the resources of the Yosemite National Park Co. for more immediate expenditures in facilities for summer visitors continue to postpone the erection of the hotel, but there is no question about the building of the new hotel. The site finally selected for the hotel is that formerly occupied by Camp Lost Arrow, not far from the foot of Yosemite Falls. This is a secluded spot and is very beautiful.

At Glacier Point a few tents were erected to afford cheaper accommodations than those of the hotel.

CAMP CURRY ALSO ENLARGED.

Camp Curry made several betterments in its plant. It erected a new transportation office, a post office, telephone and telegraph station, and a storage building for automobiles. It enjoyed a most successful season and, like the other hotel and camp enterprise, gave good service at reasonable rates.

Expansion in housing facilities must continue in Yosemite Park because travel will grow heavier each year, and the time is not far distant when the year-around road from Mariposa to El Portal will be built.

MARIPOSA-EL PORTAL ROAD DELAYED.

This highway, which is so essential to the development of the winter use of the park, has been indefinitely delayed because of lack of funds to do the construction work. The State of California was unable to market its highway bonds, hence had to curtail much of its extension program. Some funds from the sale of bonds might have been used for the Yosemite Road had it been possible to market the securities.

On the other hand, the plan covered in my last report, whereby \$5 certificates, good for admission to the park when exchanged at the park gates for automobile permits, were to be sold at par, the proceeds to be used to build and pave this road, failed to meet with the popular support that was expected. The funds raised under this plan have now been placed in trust, to be used in paving a part of the Mariposa-El Portal Road when it shall have been graded and made ready for permanent surfacing.

It is to be regretted that this project has been temporarily postponed, not alone because it holds back the consummation of plans for the winter use of the park on a large scale, but also because the present approach roads to the park—the Big Oak Flat and Wawona Roads—are usually in such a bad state of repair as to discourage travel in summer time. If something could be done immediately to improve conditions on these other highways, both outside and inside the park, the need for the entirely new road would not be quite so urgent, but it should be constructed as soon as funds are available, regardless of the other approaches to the park.

SOME PARK ROADS IN DISREPAIR.

Lack of money to do ordinary maintenance work in the spring caused some of our park highways to fall into a serious state of disrepair. Especially was this true in the case of the roads above the valley, all of which are old wagon roads, with steep grades, bad curves, and far from modern in any respect. They rutted badly, then became excessively dusty. They deserved the condemnation leveled at them, and yet we were powerless to relieve the situation. Furthermore, the heavy traffic on the floor of Yosemite Valley wore out completely the gravel surfacing of the roads there. The gravel used was disintegrated granite, which crumbles easily and is short lived as a road surfacing.

ROADS MUST BE REBUILT, THEN PAVED OR SPRINKLED.

Not only must all of the valley roads be hard surfaced, which means concrete paving, but the old roads above the valley must be rebuilt and a sprinkling system on each must be installed. The Tioga Road, although generally better than the other mountain roads, must be reconstructed ultimately, but the new road from the valley to Tuolumne Meadows by way of Nevada Falls should precede any very costly work on the Tioga Road.

The superintendent, in his report on page 251, covers the highway needs of the park very fully. His recommendations have my full approval. Some of them I have already forwarded to you with the estimates for the 1922 fiscal year, as they include requests for funds for the most important improvements, all of which should be made next year if the park is to even maintain its present popularity.

CAMPERS THROUGH THE VALLEY.

Last year over 18,000 people camped in the free public camps on the floor of the valley, and this year they increased to 25,000. Many of them spent the entire summer on their chosen pleasure ground. On any given date of the season there was the population of a fair-sized city living in the public camps, not to mention those who patronized the hotel, lodges, and permanent hotel camps. The problems of sanitation and water supply were of transcending importance, and caused no little anxiety.

As far as the sewage difficulties are concerned, the end is in sight. As stated already, a new sewer system is under construction.

TUOLUMNE MEADOWS SECOND ONLY TO VALLEY.

As a campers' resort Tuolumne Meadows still stands next to the splendid valley, and its visitors are increasing in proportion to the increase in tourists who come to the park to camp. Soon automobile camps, with water supply, sewage and garbage disposal facilities, and other conveniences, will have to be established here for the protection and benefit of the park and the visitors themselves.

WILD COUNTRY NOT OVERLOOKED.

After reading what has already been said about the year's developments in Yosemite Park, the Sierra Club member and other reader interested in the out-of-the-way places of the park may feel that too much attention is being given to the care and entertainment of motorists and other visitors who use only the roads and the hotels, lodges, and permanent camps. This, however, is not the fact. We are moving forward as fast as possible with the construction of trails in and about the Tuolumne River Canyon, which has never been opened even to pedestrians, and which of course never will be accessible to motorists. It was impossible, however, to accomplish much this year on account of inability to procure the special type of labor needed to perform heavy trail construction work. The trail from Hardin Lake into Pate Valley will be finished next year, and if appropriations are made as requested the trail from Waterwheel Falls down the Tuolumne River to Pate Valley will be built. Also,

a trail will be constructed via the north wall of the canyon up Piute Creek to connect with the Pleasant Valley, and other trails belonging to the system in the extreme northern part of the park.

LARGE AREAS TO REMAIN UNDEVELOPED.

In the Yosemite National Park, as in all of the other parks, the policy which contemplates leaving large areas of high mountain country wholly undeveloped should be forever maintained. Under this policy I never consider opening up any of the territory north of the Tuolumne River Canyon, the canyon itself, or any part of the region below Mount Lyell.

BOUNDARY CHANGES ADVISABLE.

This brings up the question of certain desirable changes which ought to be made in order, first, to eliminate some serious questions relating to grazing that now arise annually in the administration of land in the western part of the park, and, second, to include in the park a wonderful scenic area on and about the crest of the Sierra Nevada Range, which formerly belonged to the park and which was eliminated some 15 years ago in the interest of expected mining operations which never proved to be feasible.

The area that should be eliminated from the park includes a number of private holdings which are used as summer range for cattle. These holdings are not fenced, with the result that cattle are constantly trespassing on the park. It is believed that the western line should be moved back several miles, thus removing from the park lands that might be used for grazing under Forest Service jurisdiction.

On the other hand, the annexation of the back country, including Mount Banner, Mount Ritter, Thousand Island Lake, the Devils Postpile, Rainbow Falls, and numerous other scenic features of unusual interest and charm, would be a great addition to the park. It is desirable that these boundary changes be made in the early future, in order that the rather extensive trail developments which we hope to make within the next few years may extend to the area proposed for return to the park.

FEDERAL JURISDICTION ACCEPTED.

In last year's report I recorded the cession of exclusive jurisdiction over the California national parks by the legislature of the State of California. The act of cession was signed by the governor April 15, 1919. On June 2, 1920,⁹ the President of the United States approved the bill accepting the State's tender of jurisdiction, and upon notification to the governor of the approval of the bill all control over the park by the State ceased. Mr. C. A. Degnan was appointed United States commissioner. This complete control of the park by the Federal Government has already resulted in a stricter observance of park rules and regulations by tourists.

EDUCATIONAL WORK CONTINUED.

In the summer of 1919, as noted in my last report, the Le Conte memorial lectures were established by the University of California.

⁹ For text of law, see Appendix D, p 362.

The first series of these lectures was delivered in June and July of last year by Dr. François E. Matthes, Dr. W. F. Badé, Dr. Willis L. Jepson, and Dr. A. L. Kroeber. This year the second series was delivered, June 22 to July 16, by Dr. Joseph Grinnell, who spoke on zoological subjects; Dr. C. Hart Merriam, on the Indians of the Yosemite region, their customs, beliefs, implements, and industry; Dr. J. C. Merriam, on Le Conte philosophy; and Dr. A. C. Lawson, on geological subjects. The lectures were an unqualified success.

NATURE GUIDE TALKS.

Under the direction of Dr. H. C. Bryant, of the University of California, and in cooperation with the California State Fish and Game Commission, a nature guide service was established. This embraced daily excursions about the floor of Yosemite Valley and adjacent cliffs for the purpose of studying the flowers, trees, birds, rocks, and other natural objects. Camp-fire lectures were given at night.

During part of the summer Prof. Loye Miller, naturalist and expert in bird calls, participated in the conduct of the nature guide service. This service, too, was in every respect successful and will be continued next year.

RANGER CLUBHOUSE AND THE ADMINISTRATION BUILDING.

One more event of the season remains to be recorded. Only a few days ago the new rangers' clubhouse, a gift to the Yosemite force, was dedicated. Including the schoolhouse, this furnishes the second unit of the new administrative village. This building is of particularly artistic design and will guide the construction of all of the other buildings in the headquarters village.

The next building to be erected should be the administration headquarters structure, including offices for the superintendent and his force, the information office, museum, post office, and United States commissioner's court. This building is sorely needed, and an estimate has just been submitted covering its construction next year. It will be erected on the site originally selected for the large new hotel. I can not too strongly emphasize the necessity for moving forward with this administrative village, as it is naturally the standard by which the general public will measure its interest in and respect for what the Government is doing in the park.

SEQUOIA NATIONAL PARK.

Early in the present calendar year it appeared for a time that all of the general legislation affecting Sequoia National Park then pending in Congress would be enacted into law forthwith, and that when the preparation of this report would be undertaken the park would be enlarged and changed in name to Roosevelt-Sequoia National Park; also that exclusive Federal jurisdiction would be exercised over the big reservation.

THE ROOSEVELT PARK BILL AGAIN BEFORE CONGRESS.

The extension bills came up for consideration in February, and both Senate (S. 1391) and House (H. R. 5006) measures were favor-

ably reported by the Public Lands Committees. In the case of the Senate bill the committee, on February 25, 1920, recommended passage without change in form or substance.¹⁰ However, when the legislation came up for consideration in its regular order, objection was interposed to its enactment. The objection was probably the result of Forest Service opposition. No hearings on the Senate bill were held.

HEARINGS BY HOUSE PUBLIC LANDS COMMITTEE.

On the House side hearings were held on February 24, 25, and 26, 1920, by the Public Lands Committee. The bill as introduced was indorsed by the following, who personally appeared before the committee: Mrs. Marion Randall Parsons, representing the Sierra Club; Mr. H. E. Patterson, secretary of the Fresno Chamber of Commerce, representing the chamber and other business organizations; Mr. Jesse B. Agnew, representing the Visalia Board of Trade; and also Mr. Carl Bachem, timber expert employed by the Interior Department; Mr. H. M. Albright, field assistant; and myself. Opposing the bill as drawn, and urging extensive reductions in the territory involved were Col. H. S. Graves, Chief Forester, and his assistant, Mr. A. E. Sherman.

After due consideration of the data presented in the hearings, the committee concluded to report the bill with certain changes in the boundary line, which were acceptable to this department but not favored by the Department of Agriculture. The committee report was filed on March 25,¹¹ but the bill has not yet received the final consideration of the House.

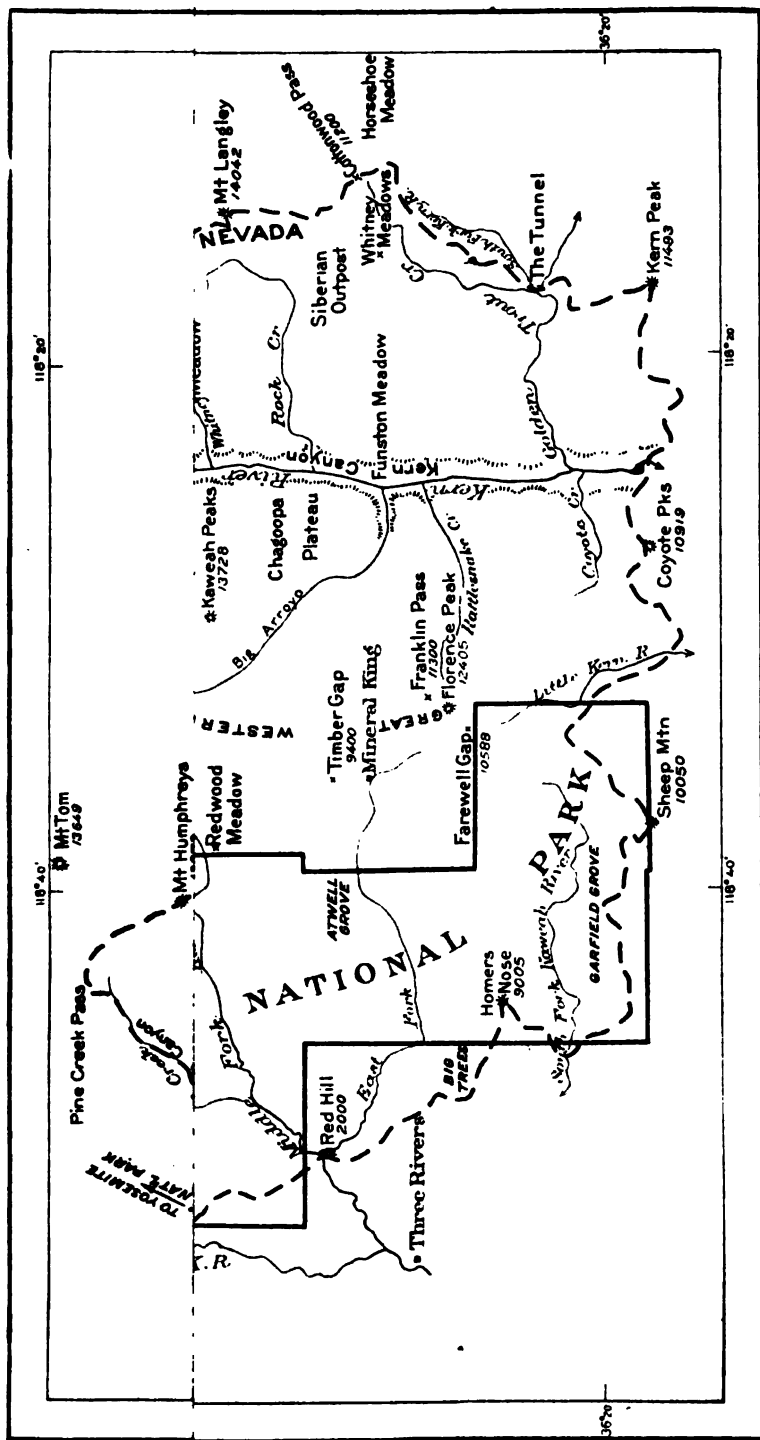
OPPOSITION DEMANDS BOUNDARY REVISION.

Sentiment in California and in Congress is generally favorable to the Roosevelt National Park plan as covered by the pending legislation. The Forest Service, however, continues to contend that areas more valuable for grazing, lumbering, etc., than for park purposes are affected by the proposed enlargement of Sequoia Park, and for that reason seeks a revision of the suggested new boundaries. We feel, however, that the revisions urged by the Forest Bureau, if accepted, would result in the establishment of a park area that would be extremely difficult to manage. The eliminations of territory suggested by the opposing bureau include the Evolution Basin on the north, part of the rim of the great canyon of the Middle Fork of the Kings River (Tehipite Valley), the Horse Corral Meadow, and the J. O. Pass region, Hockett Meadow, Mineral King, and Franklin Pass sections of the present and proposed parks, and, finally, the Whitney Meadow territory, with its golden trout (*Salmo roosevelti*) streams. Some of these revisions would not interfere seriously with park administration and improvement, but, on the other hand, several of the more important revisions would have very detrimentally affected the park-extension plan. Negotiations looking toward an adjustment of the differences between the two sides are still in progress.

All concerned with this legislation are hoping that it will be disposed of soon in order that we may plan for future development

¹⁰ See committee report in Appendix D, p. 371.

¹¹ See committee report in Appendix D, p. 374.



MAP SHOWING PROPOSED ENLARGEMENT OF THE SEQUOIA NATIONAL PARK TO BE KNOWN AS THE ROOSEVELT-SEQUOIA NATIONAL PARK.
12499-20. (To face page 114.)

of the territory added to the park or retained in the forest, as the case may be, and it is not unlikely that the questions at issue will soon be settled and the bill passed before the adjournment of the Sixty-sixth Congress.

FEDERAL JURISDICTION ESTABLISHED.

As noted in the discussion of Yosemite affairs, exclusive Federal jurisdiction over Sequoia and General Grant Parks was accepted by act of Congress approved June 2, 1920.¹² Mr. Walter Fry, for many years superintendent of these parks, was appointed United States commissioner under the jurisdiction act. He was also appointed disbursing officer of the park. At a dinner in his honor on August 2 in Visalia, Judge Fry's long and successful administration of the big-tree parks was the subject of laudatory comment by many prominent citizens and leaders in local and national affairs. During the evening a gold watch was presented to Judge Fry as a token of his splendid and faithful public service.

THE NEW SUPERINTENDENT.

Succeeding Judge Fry, Lieut. Col. John R. White was appointed superintendent. Col. White had previously served in the National Park Service, and is not only acquainted with the field work of the bureau, but also with the activities of the Washington office. His administration thus far has been vigorous and successful.

MORE BIG TREES SAVED.

Next to the years 1890, when the park was created, and 1917, when the larger part of the Giant Forest was acquired by congressional appropriations and gift of the National Geographic Society, the year 1920 will stand as the most important in conservation of the giant sequoia trees. Early in the year options on several holdings were purchased and conveyed to the United States. One very important tract of 40 acres in the Giant Forest was acquired by Mr. Chauncey J. Hamlin, of Buffalo, N. Y., and donated to the Government. Again other public-spirited gentlemen placed funds in the hands of the National Geographic Society for the purpose of making purchases of patented lands in the park. These are referred to on page 50. Further options on 1,320 acres are now held, and I hope these can be acquired soon through private subscriptions. After all these lands under option are secured there will remain 1,360 acres of patented land in the park, and it is hoped that they can be acquired through exchanges of other Government lands.

IMPROVEMENTS IN PROGRESS.

Lack of funds has prevented the accomplishment of much improvement work in Sequoia Park, but some important projects are being developed. For instance, a new telephone line between General Grant Park and Sequoia Park headquarters is under construction, and very soon a new administration building and superintendent's residence will be erected. Trails leading out of the Giant Forest to near-by

¹² See text of law in Appendix D.

meadows and other places interesting because of their flowers or trees have been built during the summer, while camp grounds in all accessible parts of the park have been enlarged and improved. The General Sherman Tree has been protected from automobile traffic about its base, and unsightly signs on many of the monster trees have been removed. These and many more similar achievements mark a summer's activities under a meager appropriation, most of which necessarily must have been spent on road improvement.

SANITATION AND WATER SUPPLY STUDIED.

Cooperating with us in a study of sanitary conditions and the water supply in the Giant Forest, the United States Public Health Service secured data upon which it recommends the early installation of a sewer system and a new water system. These improvements will probably cost in the neighborhood of a quarter of a million of dollars. Estimates to begin work are now ready for submission to the department.

ELECTRIC-LIGHT PROBLEM PUZZLING.

It will be necessary to erect an electric plant if travel to the Giant Forest continues to increase. Electricity would also be most useful in lighting Crystal Cave, which should be opened as soon as it can be properly protected. An estimate to remove the old Yosemite power plant and install it in Sequoia Park has been submitted.

MIDDLE FORK ROAD COMING.

The proposed new road to the Giant Forest from the Middle Fork of the Kaweah River is our most essential improvement project for several reasons. First, the State has promised to expend \$300,000 paving the road to the Middle Fork gateway if our new road is built, and, second, the old road up the Marble Fork is in a bad state of disrepair and is no longer safe for two-way traffic. To begin work on this highway next spring, funds will be asked immediately, and I can not too strongly urge the necessity for favorable action on the estimate as submitted.

BUSINESS INTERESTS CHANGE HANDS.

The Kings River Parks Co., many stockholders of which are interested financially in the Yosemite National Park, has taken over several business establishments in Sequoia and General Grant Parks under a two-year permit from the Interior Department. Among its purchases were Camp Sierra in the Giant Forest, and pack and saddle horse service at that point, the hotel camp in General Grant Park, the trail transportation facilities there, and likewise the store.

This company plans extensive developments as soon as the enlargement bill is finally acted upon by the Congress. In the Giant Forest a log lounging room with large fireplace and some heated cabins are now under construction.

GENERAL GRANT NATIONAL PARK.

Further than to note that this beautiful and popular little park has just completed a season much more successful than any pre-

ceding one, there is little to report because appropriations for its maintenance have been exceedingly small. Last year \$6,000 was the amount of its operating funds, but for the 1921 fiscal year this was reduced to \$5,300, under the policy of Congress to permit no improvements in most parks this season. Our work, therefore, was confined to maintaining our roads and trails and to the protection of the park.

PUBLIC UTILITIES CHANGE HANDS.

The Kings River Parks Co., under permit from the department, in June took over the camp and store properties in the park, having purchased them from the General Grant Park Hotel Co. The Kings River Co. also acquired the saddle-horse business in the park. Automobile transportation from Fresno continued to be operated by the Kings River Stage & Transportation Co., while a new automobile stage line to the park from Visalia was established by W. M. Collins under a yearly permit from this service.

The Kings River Parks Co. contemplates several important improvements for its General Grant properties, in anticipation of still larger travel. We, too, expect constantly increasing travel, and to perform the obligations by the Government to these visitors our appropriations should at least be doubled next year. Not only should the roads and trails be kept in better condition, but camp grounds must be extended and improved, sanitation bettered, and the water supply augmented.

INTERPARK ROAD SHOULD FOLLOW EXTENSION.

Soon after the Sequoia Park is extended by pending legislation, steps should be taken to secure funds to complete the road connecting the Giant Forest with headquarters in General Grant Park, thus furnishing what will be one of the most scenic "loop" roads of the Nation.

GLACIER NATIONAL PARK.

From a tourist standpoint, Glacier National Park has seen the most successful year since its creation. The travel this year exceeded that of last by 3,493 persons, an increase of 18.4 per cent. The increase in visitors who entered the park by private conveyances was about 14.4 per cent over that of last year. This is a small increase in private automobile travel as compared with increases in other parks, but is explained by the fact that Glacier Park does not have a complete highway system. Many motorists are deterred from visiting the park because of their inability to drive through from one side to the other. I visited the park about the middle of August and found the hotels taxed to full capacity, and the chalets that I visited had nearly as many guests as accommodations could be provided for. The tourists I interviewed were all enthusiastic over their outings, and many of them were people who had visited the park heretofore or had come on recommendations of friends who had visited the park. It is unfortunate that the climatic conditions limit the park season to only three months, from June 15 to September 15.

The park is essentially a trail park, and until extensive road improvements have been put in will continue to be so. Horseback travel this year also exceeded that of last, especially the camping parties. The popularity of the camping trips through the Belly River and northwestern sections of the park appears firmly established. With the completion next year of the main trails of the trail system contemplated for the northern portion of the park, there is bound to be a large increase in travel to the Belly River, Waterton Lake, Kintla, and Bowman Lake regions.

ADDITIONAL HOTELS AND CHALETs MAY BE REQUIRED.

Undoubtedly the travel of the next few years and the development of the roads and trails will make necessary the erection and operation of another large hotel, perhaps in the Belly River region, and probably hotels of somewhat smaller capacity will be required in the Bowman Lake and Kintla Lake sections as soon as improved roads on the west side of the park make automobile travel possible to these lakes.

The travel for the past two years has, at times, severely taxed the capacity of Going-to-the-Sun Chalet and Granite Park Chalet, and within the next year or two, if the travel increases as I anticipate, it will be necessary to convert the former chalet into a hotel or at least provide hotel accommodations by the construction of one or more thoroughly modern dormitory buildings, fitted with steam-heated rooms, hot and cold water, and other modern hotel conveniences. Going-to-the-Sun Chalets, which are situated at the upper end of Upper St. Marys Lake, are easily accessible by launch from the main highway, and because of the superb mountain scenery will always constitute a popular resort; with the completion of the transmountain highway at some future date, the second link of which will be built from the Blackfeet Highway to Going-to-the-Sun Chalets, the travel to this hostelry will increase enormously, and it is safe to predict that eventually a hotel of 500 guests capacity could be operated at Going-to-the-Sun with great success throughout the great part of the season.

Because of the popularity of the triangle trip since the completion of the Logan Pass Trail night stop-overs at Granite Park have increased and housing accommodations are at times severely taxed: with the increasing trail travel to the northern part of the park and the introduction of new regular schedule trips between Many Glacier, Belly River, and Granite Park, additional travel accommodations at Granite Park will be absolutely necessary.

It is also probable that at no late date a chalet or small hotel will be required at Logan Pass. Undoubtedly when the transmountain road is constructed this will be the point from which many tourists will desire to begin their horseback and trail trips, and with the large number of marvelous scenic attractions, including the Mount Clemens Glacier, the Hanging Gardens, Hidden Lake, Twin Lakes, Avalanche Basin, Sperry Glacier, and Granite Park, all readily accessible from this point, to which trails would emanate from Logan Pass, it is easily seen that there will be urgent need for lodging and eating accommodations at these places.

SADDLE-HORSE SERVICE.

The heavy travel in the park, and especially on days when there were conventions or large outing parties, severely taxed the equipment of the operators. To meet the travel requirements of next season plans are already made to install additional equipment.

No complaint was heard here during the year regarding the inadequacy of saddle horses, and it has been possible to accommodate the tourists with horses at any time requested, whether it was for regular scheduled trail trips or special camping trips. The operator deserves the highest praise for this. Prior to the opening of the park season the public operator purchased about 100 new saddle horses and equipment, making a total of over 550 saddle horses available. Unfortunately, due to the acute labor situation, the most competent guides, packers, and other helpers required in connection with the operation of such a large number of horses were difficult to obtain. Considering the large number of guests that rode over the trails, many of them never having been on a horse before, it is indeed interesting to reflect upon the absence of serious accidents. The popularity of the scheduled saddle-horse trips and camping trips has increased to the point where Glacier Park now occupies the unique distinction of being essentially a saddle-horse park. More saddle horses are used than in any other park or recreational place in this country.

LAUNCH SERVICE.

A launch service is operated on Lake McDonald, Upper St. Mary's Lake, and Middle Two Medicine Lake. Due to an accident to the launch on Two Medicine Lake, it was out of commission for a considerable time and but comparatively few launch passengers were carried. Rowboats and canoes at various places throughout the park were well patronized as usual. The greatest demand for these pleasure boats was at Lake McDermott, which is comparatively a small lake. Further expansion of this service will be made.

Canadian travel from Waterton Lake to Glacier Park has developed to a point where launch service is of great importance. For several years we have had an operator carrying passengers from the foot of Waterton Lake in the Canadian Park through to the head of Waterton Lake in our park. Plans are under consideration to construct a floating pavilion at the upper end of Waterton Lake, with possibly a small semipermanent camp, with a log mess and assembly room, supplemented by sleeping tents. The tourist travel handled in launch operation on the Waterton Lake was 930 passengers during the season. Two operators with two launches are available.

FISHING.

The fish hatchery at Glacier Park, constructed two years ago, was put into operation last year by the United States Bureau of Fisheries. The building should be fully completed and made more attractive to visitors. Plans for a permanent water supply are under consideration. The hatchery was operated throughout the season this year with excellent results. About a million and a half trout and grayling fry were planted in the park waters, over a million being trout of the rainbow, eastern brook, and black-spotted varieties. The

officials of the Canadian Waterton Lake Park cooperated with us in these plantings by sending a truck down from Canada and transporting the fry and the rangers who looked after the planting. The Canadian officials realized that their park would receive considerable benefit from the stocking of these streams which flow into Canada. Five thousand fry were packed by saddle horse and planted in Elizabeth Lake. This lake will be closed to fishing for two years in order that these fry will have a chance to establish themselves. Fishing in the park is steadily improving and appeared considerably better this year than it has for several years past. Undoubtedly this is due to the extensive stocking, which is made possible by the operation of a hatchery in the park. Glacier Park is rapidly obtaining a name as one of the best parks for fishing.

FOREST FIRES.

The forest-fire situation was greatly improved over last year. The extremely dry and hot weather of July and the early part of August constituted a bad forest-fire hazard, and three very severe electrical storms that visited the park during the season started a number of blazes. The green vegetation and the absence of high winds at the time fortunately helped the hard-working fire patrols to restrain them to small areas. Of the 20 or more fires, on which patrols and fire fighters were employed, only 4 or 5 reached any magnitude, and these were limited to only poor or sparse timber and on locations remote from the roads and trails.

This is the fourth bad fire year in succession in Glacier, and the conditions that existed this year might have resulted in as serious fires as burned last year, when practically all the park appropriation was used in fighting them. Recognition must be given to the necessity for more adequate forest-fire protection. Additional fire lanes or fire-patrol trails will have to be constructed in the western portion of the park. An adequate supply of fire-fighting tools should be readily available.

I have already dwelt on the necessity of a separate fire-fighting fund, and nowhere is the absolute urgency of such a fund indicated as in Glacier Park. This is our fire park. The fires this year required the services of nearly all the maintenance and improvement crews, and we were forced to call in outside assistance. When the fires were at last under control and the men released from fire fighting, most of them quit to go to the harvest fields. As a result many of the needed improvements planned for this year, some of which were under way, had to be given up, as it was impossible to hire additional men, due to the labor shortage. Special funds should be available so that a suitable fire-fighting force could be recruited from outside of the park, thus avoiding the necessity of taking off from the maintenance and repair work the regular force of employees whose time is fully required to carry on that work, and, above all, eliminating the necessity of using precious park funds for this purpose.

NEW ROADS.

In the estimates for this year I have included three principal items for new road construction and improvement in Glacier Park. The

first project is to widen and regrade a portion of the Blackfeet Highway which, when originally constructed, was made a one-way wagon road and is poorly adapted for the automobile travel to which it is now subjected. The funds estimated for this are sufficient to improve about 10 miles of the road. At least 10 miles more should be improved during the following fiscal year. The second project contemplates the construction of about 4 miles of new road around the Two Medicine Reservoir site, so that the Reclamation Service may utilize the storage of the Lower Two Medicine Lake Reservoir. The present road to Two Medicine Chalet, which follows along the shore of the present lake, will be inundated when the storage of water in the reservoir is undertaken. The final road project, and perhaps the most important, is the construction of the first unit of the transmountain automobile road, which is to connect the east and west sides of the park by a road along St. Marys Lake, through Logan Pass to the present Belton-Lake McDonald Road. I feel the real development of Glacier Park depends upon the construction of this transmountain road. The very fact that motorists to-day are obliged to ship their cars from the eastern and western entrances prevents a great many people from visiting the park, and detours many of the Park-to-Park Highway motorists to some southern route, thus not only preventing their visiting the park and enjoying the magnificent scenery but also depriving them of a trip through one of the most interesting and beautiful sections of northern Montana, such as is found for miles along the highways leading to and from the park. Paradoxically as it may be, the one vital missing link that exists in the Park-to-Park Highway is this transmountain road, which will some time become the strong link of the chain. The route is both scenic and necessary, and represents no real engineering difficulties. The cost of construction of the road would be less than the cost of the same number of miles of road which are being built by many of the States and counties in different parts of the western United States. It will supply a long-felt want.

The first link of this road will be from the foot of Lake McDonald to the head of Lake McDonald, thus making automobile travel possible to Glacier Hotel; the second link will be from St. Marys through to Going-to-the-Sun Chalets, which will make this very popular resort accessible to many who do not now visit it. The remaining 30 miles of road can be easily completed in the next three years, and when this is done Glacier Park will have the distinction of having one of the most scenic, if not the most scenic, transmountain highway in the United States.

Plans and estimates for maintenance work include repairing the North Fork Road, which follows in general the North Fork of the Flathead River, from the foot of Lake McDonald through to the Canadian line. This road is especially in need of improvement work and deserves to be made into a fairly good automobile road, so that the visitors to the west side of the park may have access to the many beauty spots that are contiguous to this road, especially the wild and beautiful sections of Kintla and Bowman Lakes.

TRAILS.

Hand in hand with the road development, the development of the trails in Glacier Park should go forward. As I have stated, Glacier

Park is essentially a saddle-horse park, and it probably always will be. The many wild and almost inaccessible regions, which can not be fittingly developed and made accessible other than by horse and foot trails, will always leave the greater part of the grandest scenery to be enjoyed best by those who exert themselves the most and visit these places either by foot or on horseback.

Since my last report, construction has been started on a trail from Many Glacier Hotel through to Belly River by way of Swift-current Ridge, the south fork of Kennedy Creek, Red Gap, and Elizabeth Lake, and this work has been sufficiently advanced this season to permit the use of the trail by tourist camping parties. This made the trip from Many Glacier Hotel into Belly River a one-day trip instead of two days as heretofore, when it was necessary to go by way of Slide Lake and Gable Mountain. Some work will be done this season on other short trails in the Belly River section, and it is hoped that by the end of the next season we will have trails constructed into the Mount Cleveland Basin, to Margaret Lake, and also that the cut-off trail, which was started this year, from the head of Sexton Glacier Trail to the Piegan Pass Trail, by way of Preston Park, will be completed. Foot paths should also be built to the near-by viewpoints at Many Glacier and Glacier Hotels, and Going-to-the-Sun Chalet, in order that park visitors who desire to climb these points may have a reasonably good trail.

Some work was done this season on the construction of a trail from the head of Glenn's Lake over Indian Pass and through to the head of Waterton Lake. The early snows of this fall and the shortage of men, however, necessitated the suspension of this work before the trail was completed. The trail will be completed early next season so that it will be available for use of camping parties in their trips between the Belly River Valley and Waterton Lake Valley. At the present time it is necessary for these parties to make a detour through Waterton Lake Park. This trail, when completed, will be one of the most scenic trails in the park, in that it passes four beautiful waterfalls occurring at the Four Head Walls on the east side of the pass, and also just below Shepard Glacier and its wonderful waterfall, then passes near the north end of Mount Cleveland, the highest mountain in the park, affording from different vantage points along the trail unsurpassed views of striking mountain and lake scenery. This route, in general, will follow the old Indian trail across the mountains, the remains of which are still apparent in many places, although the Indians have not traveled it for many years. Thus the trail will have a historical significance for the tourist.

I am also planning to have a trail constructed next year from Browns Pass by way of Hole-in-the-Wall Falls, over Boulder Peak Pass, through to the head of Upper Kintla Lake. This will complete the chain of northern trails and make it possible for tourist parties to visit all of the northern valleys and lakes by interesting trails, and will develop and make available additional scenic spots.

Of the 350 miles of trails already built in the park, there are, of course, many improvements needed, and I hope, within the next few years, to be able to protect any narrow or dangerous places in the regular tourist trails by parapets and other safeguards; to improve them in general, and to have them thoroughly marked by direction,

name, and mile-post signs. Something along this line will be done each year as the funds available will permit.

TELEPHONE LINES.

The construction of a telephone line from Belton to Glacier Park is urgently needed. I have several times submitted estimates for such construction, but have not been successful in securing funds for the work. I am again submitting an estimate for this line, and also for telephone lines to connect the outlying ranger stations. These are all vital to the proper administration of the park. The present lines are hastily built makeshifts, adjusted for the most part to trees, and the service is anything but satisfactory.

SHERBURNE LAKE RESERVOIR.

The Sherburne Lake Reservoir, situated in the park near the Many Glacier Road, was put into operation in a limited way last year by the Reclamation Service, and was used for small water storage again this year. Thus far, the water impounded has raised the former lake level only a few feet, but the result of this increase in the height of the water level shows only too plainly by the timber that has been killed, and by other unsightly conditions, what is to be expected when the reservoir is utilized to its full capacity.

On my visit to the park this year I met Director Davis, of the Reclamation Service, and took up with him, and endeavored to secure, some satisfactory arrangement whereby Sherburne Lake Reservoir, situated along one of the most beautiful portions of the highway approaching Many Glacier Hotel, could be cleaned of trees and all débris that make it unsightly, and prevent such a scar in Glacier Park as at present exists in the proposed extension of Yellowstone Park by the flooding of the Jackson Lake Reservoir site by the failure to clean out the dead timber. On my return to Washington a co-operative agreement on a fifty-fifty basis has been arranged with your approval whereby the clearing of the timber and the reconstruction of the Babb-Many Glacier Road will be undertaken by the two bureaus. The Reclamation Service has included in its 1922 estimates an item of \$70,000, and I have forwarded to you a supplemental estimate of \$50,000 for this purpose. It is earnestly hoped that this fund will be granted by Congress.

WILD ANIMALS.

The heavy snows and severe weather of last winter caused considerable loss among the wild animals of Glacier Park, and it is doubtful if the natural increase of this year has offset the loss of last winter. State or congressional legislation should be enacted providing for the protection of the elk, which are forced out of the park by the storms of winter, for unless protection is given the elk and deer that are driven into the forests south of the park and on the Blackfeet Indian Reservation on the east, there will be but little increase among these animals.

YELLOWSTONE-GLACIER TRAIN SERVICE.

No definite interchange or direct service has been adopted by the Great Northern and Northern Pacific Railways to permit passengers to travel without change of cars from Glacier Park to Yellowstone

Park, and vice versa. I am sorry to see this. It is believed that the volume of tourist travel occurring each way between these parks during the park season, if supplemented somewhat by local travel, as it would be, would warrant the establishment of an interpark sleeping-car service that would permit tourists to go to bed at Glacier Park and arrive at Yellowstone Park the morning of the day next succeeding, and vice versa. Such a service would materially increase the travel between the two parks and greatly decrease the discomforts to the traveler that are attendant to the service that now exists. The Great Northern runs a cut-out sleeper to Glacier and the Northern Pacific to Yellowstone, and it would seem easy to effect such an interchange of service.

SUPERINTENDENT PAYNE RESIGNS.

On June 30 of this year Supt. W. W. Payne tendered his resignation during an investigation by the department regarding the conduct of his office. Civil Engineer George E. Goodwin was placed in charge as acting superintendent, and at this writing still holds that position.

GRAND CANYON NATIONAL PARK.

Our first year in the administration of the Grand Canyon as a part of the national-park system has just been closed with gratifying results. It was not practicable for the service to assume charge until August 15, 1919, after Congress had granted an initial appropriation for the administration and development of the area as a park.

The formal dedication of the park to its great purpose took place on April 30 last, and has already been described in detail on page 78. Many visitors distinguished in public and private life took part in the services, speaking on the history, legends, administration, and founding of the park. The Hopi Indians, as first dwellers in the region and guides to the early Spanish explorers, were interesting participants in the ceremonies.

ALL-YEAR RESORT.

Park travel since October of last year shows 67,315 visitors, an increase of 29,570 over the number of visitors for the same period of the preceding year, estimated from the records of the Forest Service and the public operators.

Among the prominent visitors to the park during the year were their Majesties the King and Queen of the Belgians, who, with the Crown Prince and a distinguished entourage, spent the whole day October 18 in visiting the canyon.

The park is both a summer and winter resort. Though thus far developed by private capital, the results generally have been achieved with refinement and success. The character of existing buildings is commendable, and, although considerable adjustment will have to be done in the location of certain future buildings, this can readily be effected. Our landscape engineer department has studied the future layout of all buildings, and construction for both the public operators and the park administration will proceed along well-laid-out lines.

The facilities extended by the Santa Fe Railroad as pioneers in this region and by the Fred Harvey Co. in developing hotels and camps have always attracted an enthusiastic and left a satisfied class of visitors. The public operators have already increased the size of their garage building, but it is quite evident that they will soon have to provide additional garage accommodations if they are adequately to take care of the increase in the number of private automobiles that are bound to flow in.

Although the first appropriation was not large for the amount of work to be done, since it amounted to only \$40,000, these funds were carefully distributed and some improvements accomplished. In part these consisted in the construction of a stable and garage building, of a mess house, ranger quarters, which are being temporarily used for administrative offices, and improvements to a log cabin now being utilized by the acting superintendent as a residence. These are all at the Grand Canyon administrative site. Ranger and construction and maintenance forces have been established, and there is at this writing a competent nucleus for carrying on all the park work under present conditions.

SUSPENSION BRIDGE TO BE BUILT.

The appropriation of \$60,000 for the present fiscal year enabled me to plan somewhat more extensively for actual improvements. One important piece of construction is a suspension bridge across the Colorado River at the foot of the south-side Bright Angel Trail to connect with the north-side Bright Angel Trail. At present the only method of crossing is in a small swinging cage traveling over a small cable, which only the most venturesome persons care to use; animals can not be transported. Proposals on this work were sought some time ago but no bids secured. The specifications are being readvertised, and I hope that we will be successful in securing satisfactory bids, so that the bridge may be constructed during the coming months. Without some means of animal travel from the south to the north side of the park it will be difficult to administer the north rim or provide for its proper development and use by park visitors.

The north rim, which is, from my own observation, this summer more beautiful than the south rim, is practically undeveloped by roads and trails. As soon as this first suspension bridge is completed across the Colorado River it is planned to reconstruct a portion of the Bright Angel Trail on the north side of the river, which will make the north rim easily accessible. A sum has already been allotted from available funds to start, and I hope complete, the trail during the coming winter. Later another bridge across the Colorado will be constructed near the foot of Hermit Trail, which in turn is to be connected by a trail to the north rim as a part of the trail development planned on the north side of the park; also an additional bridge should be placed in the vicinity of the present Bass cableway. I predict north and south rim travel will constitute the most interesting and popular of all our scenic park trips.

ADDITIONAL CAMPS NECESSARY.

With the construction of these bridges travel between the north and south rim will cause the establishment of additional camps. One

of these camps should be located at some convenient place on the trail, which will be constructed from the Hermit suspension bridge through to the Plateau Trail, and as near the north rim as it will be possible to secure water. Expansions into the Indian Gardens camping area are planned for the immediate future. These camps will in a way supplement the El Tovar Hotel and the Hermit Camp on the south side, and also the present Wylie establishment on the north rim. The influx of tourists carries with it an increased demand for camping space, and also larger hotel facilities, and, as quickly as this demand is recognized, the facilities will be expanded.

IMPORTANT ROAD PROJECTS.

Important allotments of funds have been made for the maintenance of roads and trails, small it is true, due to the smallness of the appropriation, but nevertheless sufficient to keep them in passable shape for the present. Our most important present road project at the canyon undoubtedly is the repavement of the Rim Road. Up to last December only horse travel was permitted on this road; at that time I directed the opening of the road to motor travel, and the public transportation service was changed from horse to motor-propelled vehicles. Since then the road has suffered a great deal from the heavy travel over it. Eight miles in length, it was paved in 1913 by the Santa Fe Railroad in order that an attractive trip might be available for winter visitors. It was practically worn out when taken over by us, and is only single width and not adapted to two-way travel. While it is being repaved in parts, the only solution is to reconstruct it entirely. In the estimates for next year, I have included an item for improving its alignment and paving to full width.

I have also submitted an estimate to commence the construction of a rim road eastward from El Tovar toward Desert View. Upon its completion, within two or three years, we will have a rim-road drive from Hermit Rest on the west of official headquarters to Desert View, a distance of over 40 miles. For scenic beauty it will challenge comparison.

The estimates also include an item for securing a right of way for the El Tovar-Desert View Rim Road. I hope this expenditure of Government funds will not be necessary, as I feel that the private holdings which will be crossed by the proposed road will be sufficiently benefited by its construction to make it to the advantage of the owners of these lands to donate a right of way. I feel sure these owners are so public spirited as to take this point of view, and that in donating this right of way they are not only benefiting themselves and Grand Canyon Park but also the people who visit the park.

In addition to the improvement and maintenance work on the Rim Road and other upkeep work on the other park roads, the present El Tovar-Desert View Road has been widened, straightened, and reshaped for about one-half its entire length. Many dangerous curves and grades have been eliminated and the general conditions of the road improved.

COMMUNICATION SYSTEM.

A complete telephone system which will connect the north and south rim of the canyon and the ranger stations that will be built

for the ranger force is one of our future needs. This can be postponed until next year, and I have not included it in my estimates to Congress. It may be practicable to connect the north and south rims by wireless, either telephone or telegraph, and this question is receiving careful study.

WATER SUPPLY SERIOUS PROBLEM.

There are some developments planned by the Santa Fe Railroad in Grand Canyon, one of which is the construction of a water system which will probably have for its source Bright Angel Creek on the north side of the river, and possibly the establishment of a small power plant on that creek. The establishment of an adequate water supply for the south rim of the canyon is a serious problem and one that must soon be definitely solved. Water on the north rim near Bright Angel Point is secured at present from several small springs, that with little improvement will probably be adequate in quantity and quality. On the south rim of the canyon, however, the hotel and railroad have to haul their water by train from Del Rio, about 125 miles distant. Every gallon of water has to come that distance. The tremendous daily cost of this is at once apparent, and the great desirability of installing some system by which water can be pumped either from the floor of the canyon, about 1 mile below the surface of the rim, or from elsewhere is obvious. It is apparent that travel may sometime reach a point where with the present method of securing water we will not be able to secure a sufficient quantity of that precious fluid to supply each traveler.

COCONINO COUNTY RIGHTS IN BRIGHT ANGEL TRAIL.

The organic act creating this park authorizes you to negotiate with the county of Coconino for the purchase of its rights in the Bright Angel Toll Road and Trail, and to report to Congress the terms upon which this property can be secured. An effort has been made the past year to arrive at some satisfactory basis of settlement with the county of Coconino for the transfer of the Bright Angel Trail, but thus far without definite results. Our engineer department has, however, made preliminary examination of the situation, covering in fact the entire trail situation in the park, and it is my intention at an early date to present for your consideration certain recommendations with respect to this trail.

GRAZING.

The service has continued the policy carried on under the Forest Service of permitting grazing in such isolated instances where, and until, it does not interfere with the use of any areas by the tourists. It is not my purpose to inflict any hardship upon former permittees for grazing privileges, but the parks are set aside first of all for the use of the tourist, and when grazing in any way conflicts with, or interferes with, the fullest use and enjoyment of the visitor it will be at once prohibited.

WATER-POWER AND MINING CLAIMS.

Probably the greatest problem confronting the service upon its taking over the administration of the park was the existence of the

many claims of alleged mineral value. Among these were the claims located by Ralph H. Cameron, which have been in litigation for several years.

The following Cameron claims have been declared invalid:

BY DEPARTMENTAL DECISIONS OF FEBRUARY 11, 1909, AND NOVEMBER 29, 1911.

Golden Eagle.
Cape Horn.
Wizard.

Alder mill site.
Willow mill site.

BY GENERAL LAND OFFICE DECISION, NOVEMBER 17, 1915; PHOENIX 05215.

Magician.

BY GENERAL LAND OFFICE DECISION, MAY 12, 1919, AND DEPARTMENTAL DECISIONS, JUNE 29 AND SEPTEMBER 15, 1920.¹² CLOSED BY GENERAL LAND OFFICE, SEPTEMBER 22, 1920.¹⁴

Banjo.
Millionaire.
Sentinel Treasure.
Peg Leg.
Hill Top.
Sunflower.
Limestone.
Goldenola.
Ida May.

Buttinsky.
Cheyenne.
Dakotah.
Bannock.
Apache.
Folly.
Herndt.
Gorge.

On September 18, 1915, the United States filed a suit, Equity No. 10, in the district court to enjoin Cameron and others from occupying, using for business purposes, asserting any right to, or interfering with the public use of the land involved in the Cape Horn claim, and to require the removal of buildings and refuse therefrom. A decree in favor of the United States was affirmed in the circuit court of appeals and in the Supreme Court on April 19, 1920.¹⁵

On June 5, 1916, a like suit was instituted covering the Alder and Willow mill sites. This suit, known as Equity No. 16, was continued, pending the outcome of the first suit. It should now be possible to have this suit disposed of without delay.

A group of nine claims were located in Cataract Canyon in 1906 by W. I. Johnson, who at the same time filed power rights on four waterfalls in that canyon. An option on these claims and water rights has been taken in the past year by C. A. Heberlein, who has made application to the recently created Water Power Commission for permit to investigate and report upon the commercial feasibility of the holdings and to submit plans, specifications, and estimates of development proposed by him.

Another small group of claims are held by W. W. Bass. These claims are alleged to contain commercial copper and asbestos and are located in the canyon in the vicinity of Shinumo Creek. The mineral value of these existing valid claims has not been investigated by the service or, to my knowledge, by any representative of the department.

While other claims are scattered through the park area, the only group worthy of mention in this report are the copper claims filed

¹² See p. 387.

¹⁴ See p. 391.

¹⁵ See p. 76.

upon by the Canyon Copper Co., on the Horseshoe Mesa below Grand View Point, and a group of asbestos claims held by the Canyon Asbestos Co., across the river from the Horseshoe Mesa. Actual and extensive mining operations have been conducted on these claims and a quantity of copper ore removed and shipped. The operations ceased a few years ago owing to the increased cost of labor and transportation and the decreased price of copper. It is not believed that operations will be resumed on these claims.

JURISDICTION.

I sincerely hope that, as has been the case with the most of our national parks, the State of Arizona will cede complete jurisdiction over the park area. California has recently ceded jurisdiction over three California parks and Congress has accepted it. Enforcement of regulations and keeping of the peace is needlessly conflicted under the present system of combined State, county, and Government control, even with the existing cooperation between the various officials.

FISH AND GAME.

The history of game on the south rim of the Grand Canyon is a very interesting instance of the effect of national-park protection. Within less than a year's operations of our regulations game animals are coming back into the park; recently as many as 30 deer have been seen in one herd, and the shy antelope have commenced to adopt the park as a summer range. Summer game is increasing noticeably, and hundreds of birds have already made the village their feeding ground.

The north rim of the canyon and the entire area north of the Colorado River has for years been within a game preserve. Deer, antelope, and mountain sheep abound in great numbers. Tourists often report seeing as many as 100 deer a day, although mountain lion are plentiful along the canyon's rim and take their full toll of deer each season. The splendid cooperation of the Biological Survey and the State hunters is resulting in a reduction in the number of these animals. One Government hunter bagged seven full-grown lions in eight weeks' work in that territory.

No game fish exist naturally in the park. Bright Angel Creek has been successfully stocked during the year with eastern brook trout.

FORESTS AND WILD FLOWERS.

The idea seems prevalent that the Grand Canyon is in the midst of a desert; instead the canyon rims are covered with beautiful stands of western yellow pine and piñon, the gnarled one-seeded juniper or cedar covers immense tracts, and on the north rim occasionally the cottonwood and the graceful quaking aspen are encountered. The Douglas fir, or so-called Oregon pine, flourishes to a small extent. The pine forests are almost entirely free from undergrowth and furnish wonderful natural bridle trails and footpaths. Unfortunately, during the past few years the Black Hill beetle has made its appearance on the north rim of the canyon, but steps have been taken to accomplish its eradication. In the diversity of wild-flower growth this park also furnishes a refreshing spectacle. Due to the great

depth of the canyon, there is a range in altitude of from 2,500 to 7,750 feet above sea level. Conditions here are favorable for plant life, usually ranging between southern Canada and Central America. One will be astonished to read the list of the fine varieties of plant life encountered in this park given in the superintendent's report, which is printed in the Appendix B. During the months of March and February, when snow lies on the rim of the canyon, the lower levels of the canyon are often ablaze with the beautiful flowers of the various flowering cacti.

D. L. REABURN APPOINTED SUPERINTENDENT.

On October 5, 1920, former superintendent of Mount Rainier National Park, Mr. D. L. Reaburn, was appointed superintendent of the Grand Canyon National Park. He comes to his new duties fully equipped by past experience and accomplishments to undertake the important work devolving upon him.

Assistant Civil Engineer W. H. Peters, who has had charge of the Grand Canyon since August 15, 1919, as acting superintendent, has been appointed as superintendent of Mount Rainier National Park, succeeding Roger W. Toll, resigned.

MOUNT RAINIER NATIONAL PARK.

While in the West, on inspection trips during the season just closed, I made two visits to Mount Rainier National Park; and although time did not permit of my taking any extensive trail trips, I was able to gain a comprehensive idea of the use that was being made of the park this year by its thousands of visitors. I noted that walking and horseback trips on the trails leading out of Paradise Valley were more popular than ever before, and I likewise observed that it is the duty of the service to greatly expand the trail systems about both Paradise Valley and the Longmire Springs resort area.

ACCOMMODATIONS IMPROVED.

The chief events of the season in Mount Rainier Park related to the improvement of hotel and other facilities for the accommodation of visitors. The so-called National Park Inn Annex, erected in 1917 on the Longmire patented holding and last year acquired by the Rainier National Park Co., was moved across the road to a position adjacent to the National Park Inn, where it has continued to be operated as an annex to the main hotel.

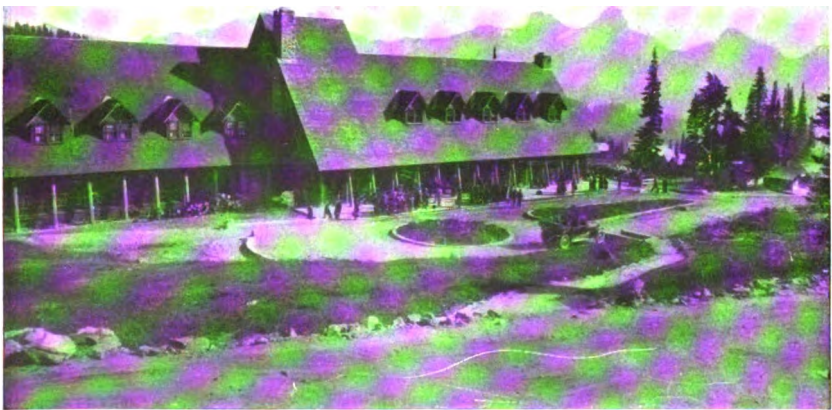
The old Longmire Hotel, a landmark of the park, but unsightly and utterly useless, was dismantled and burned before the opening of the park this year.

In Paradise Valley the Paradise Inn has been enlarged by the erection of a new wing containing 104 rooms, 58 of which have private bath. This wing was built this fall and is now ready for next year's travel, but as soon as possible the enlargement will extend to the other wings. The entire addition when finished will contain a total of 258 rooms, and will represent an investment almost twice as great as that already made by the Rainier Co. in the park. The improvements made this year in preparation for next year have cost \$225,000, which includes a \$75,000 power plant.



A. PUBLIC CAMP GROUND, PARADISE VALLEY.

Motorists bring their own camp equipment and camp out in this lovely spot.



B. PARADISE INN, PARADISE VALLEY..

This hotel was crowded to its capacity all season. A new wing has just been completed.

MOUNT RAINIER NATIONAL PARK.

Photographs by Frank A. Jacobs.



Photograph by T. H. Bate.

THE MONTEZUMA CASTLE.

An interesting description of this ancient cliff dwelling is printed in Appendix B.

MONTEZUMA CASTLE NATIONAL MONUMENT, ARIZONA.



LOOKING UP BATHHOUSE ROW AT THE GREAT AMERICAN SPA.

The remarkable curative powers of its water are now world famous.

HOT SPRINGS RESERVATION, ARKANSAS.



Photograph by courtesy of Smithsonian Institution.

THE HISTORIC INSCRIPTION ROCK.

Carved on the smooth face of this gigantic rock are records of the early Spanish explorers of our Southwest.

EL MORRO NATIONAL MONUMENT, NEW MEXICO



TOURISTS ON THEIR WAY TO ENTRANCE TO THE CAVE.

The Wind Cave, the most interesting feature of the Black Hills, is the chief attraction of the park. It is also a notable game preserve.

WIND CAVE NATIONAL PARK, SOUTH DAKOTA.



Photograph by L. W. de Via Norton.

KILAUEA'S "LAKE OF EVERLASTING FIRE."

Tumultuous night fountaining—large traveling fountains in foreground, with immense grotto in center background.

HAWAII NATIONAL PARK.



BEECH CLIFF—ONE OF NEW AREAS GIVEN TO PARK.

About 5,000 acres have been deeded to the Government for park purposes, which will be accepted as soon as titles can be cleared. The entire park area has been a gift to the Nation.

LAFAYETTE NATIONAL PARK.

FAITH AND PUBLIC SPIRIT.

Faith in the future of the park as a great tourist resort and public spirit and civic pride have combined to bring about the splendid development. Many of the most prominent business men of the Northwest have taken an interest in the park, wholly apart from the prospect of adequate financial return, and are devoting much of their time to planning and supervising this important project. Furthermore, as soon as the Carbon River Road is completed they are prepared to erect a hotel and other accommodations in the region of the Carbon Glacier. There can be no doubt that these men will more than meet the Government halfway in the development of the park, and it is a source of inspiration and encouragement to me to be officially associated with these men in the upbuilding of one of our greatest national playgrounds.

ROADS ARE LACKING.

While the public utilities of the park have spent large sums of money in improving facilities for travelers to the park and are preparing to spend additional vast sums, the National Park Service has been following far behind on account of lack of funds. So inadequate have our appropriations been that the park has really gone backward, so far as its care has been concerned. This is chiefly true of our roads, which can not be properly maintained with the small fund that is available for the purpose.

There are only a relatively few miles of highway in the park—20 miles in the southwest section and about 10 in the northeast corner. The former is the main traveled road to Paradise Valley, and is, of course, used by all cars going into and coming out of the park. The wear and tear on this highway is terrific. Gravel surfacing can not sustain the traffic. It must be paved, at least beyond Longmire Springs.

In my last report I outlined the plans of the State and county for paving roads to both the Nisqually and Carbon River entrances. The road to the Nisqually entrance, connecting with our Paradise Valley Road, will be paved next year, according to present reports. We should begin then to progressively pave our highway.

CARBON RIVER ROAD AGAIN.

This tremendously expensive outside development work, directly connected with the future of the park, also forces upon the Government the obligation to build the road up the Carbon River to the mouth of the great Carbon Glacier, estimates for which have been submitted to Congress several times. This road should certainly be started next spring, and with all dispatch possible constructed to the wonderful alpine parks near the glacier. Here the new hotel would be constructed. Estimates for \$100,000 for construction work on this project next year have just been submitted.

ALTERNATIVE ROAD TO PARADISE VALLEY.

Such a multitude of cars are now taken to Paradise Valley that some means of providing for two-way traffic at all times must be

found to supersede the present checking system under which automobiles must pass at Narada Falls.

The solution seems to be a new road from a point some distance west of Narada Falls to Paradise Valley, to care for the higher section, and then widen the present road westward to a small lake near Ricksecker Point where a short cut can be made back of the eminence rising above the point. From the junction of this short cut with the present road to the Nisqually River, widening of the existing road will meet every need. This is a most important project, essential to safety of travel, and necessary to prevent congestion and long, wearisome delays at Nisqually Glacier station.

The time is not far distant when 1,000 automobiles per day will be the average travel to Paradise Valley. Already this number has been counted on a portion of the paved road outside the park boundaries.

TRAIL SYSTEM BETTERED.

There are now over 150 miles of trails in the park. The trail encircling the mountain is 95 miles in length and is one of the most scenic trails of the national-park system. During the past year considerable trail-improvement work was performed. The trail from Tahoma Creek to Indian Henrys Hunting Ground was rebuilt to make it better for horse travel. The Klapatche Park Trail, mentioned in last year's report, was finished early in the current season. On the south side of Stevens Creek a short trail was built in order to eliminate two crossings of the stream.

However, most of the new trail work was performed in or adjacent to Paradise Valley. A trail to Alta Vista, continuing to what is known as Glacier Vista, overlooking the Nisqually Glacier, and returning by another route to Paradise Valley, was built this year, and was almost immediately acknowledged as one of the most popular trails of the region. A trail from Paradise Valley to Timberline Ridge was begun and will be finished next year. Likewise, the trail to Timberline Ridge by way of Sluiskin Falls and Mazama Ridge was partly finished.

TRAIL-MARKER INNOVATION.

A notable work accomplished by the superintendent and much commented upon was the placing of trail markers at every tenth mile on the trails, giving the distance in miles from the beginning of the trail. This installation was only partially completed.

It is impossible to overestimate the importance of extending the trails in this park.

Existing trails that should be improved very soon include one from Spray Park to the eastern side of Winthrop Glacier. This should really be a piece of reconstruction, as the trail was built a few years ago and used to some extent. The Summerland and Indian Bar trails should be better marked. A new bridge will have to be built over the South Mowich River where the main west side trail crosses, and the Indian Henrys Hunting Ground Trail from Longmire Springs must be reconstructed beyond Devils Dream Creek.

PARADISE VALLEY TRAILS FIRST.

However, the continued development of the relatively short foot and horse trails leading out of Paradise Valley is the most impor-

tant improvement in this line of development that should be undertaken, as this is the great tourist center and will continue to be for several years to come.

PARKING SPACES AND SHELTER CABINS.

Second in importance only to road and trail improvements are parking spaces at Paradise Valley and Narada Falls and other points along the Nisqually Road; new buildings such as ranger stations, storage structures, shelter cabins, and fire-lookout stations. It is particularly essential that a very large parking space be constructed at Paradise Valley, because, due to the topography of the country, when large numbers of cars reach the end of the road they now have to be parked on steep hillsides and other equally inconvenient and unsatisfactory places.

Two new ranger stations are needed. One ought to be a combined station and community center for campers, and should be erected in Paradise Valley. This should be a part of the general improvement on behalf of the motorist who brings his own camp equipment.

Several shelter cabins should be built on the trail system, and on the summit of the mountain a shelter and fire lookout station should be constructed, both for the use of mountaineers climbing to the summit and for the protection of the park and the adjacent national forests.

COOPERATION IN THE IMPROVEMENT OF TELEPHONE COMMUNICATION.

Telephone communication was enormously improved this year by the National Park Service and the Pacific Telephone & Telegraph Co. working together in the extension and development of their lines. The service built a second circuit from the park to the village of National, and from that point, at a cost of \$15,000, the telephone company built a second circuit to Tacoma, thus giving the park a through line solely for park business. Long-distance calls totaled over 500 per month, while local calls approximated 4,000 per month.

SANITATION LAGS BEHIND.

On the other hand, the sanitation of the park has received no more consideration than the roads, chiefly for the reason that, like the roads, the installation of sanitary facilities is an expensive thing to undertake. The public camps, as well as the hotels and other establishments, should have better facilities for sewage and garbage disposal, but I think that here, as in other parks, extensive sewer systems should be installed by the Government. As a general thing all public utilities of this kind should be owned and operated at a profit by the Government, and should include power plants, telephone systems, and water systems, as well as sewer systems.

In Mount Rainier National Park the time is past when the Government can undertake the installation of a power plant, as the public utility is now constructing a large plant on the Paradise River that will care for both the Longmire Springs and Paradise Valley needs, not only of their own properties but also the Government's requirements as well.

TRAVEL AGAIN EXCEEDS FORMER SEASONS.

While not far surpassing the travel of last year, there have been more travelers to the park this season than ever before. Stormy weather in the early part of the season resulted in reports showing less travel to July 1 than occurred up to that date last year. Nevertheless, the road to Longmire Springs was opened April 26, 1920, to Nisqually Glacier station May 19, to Narada Falls June 12, and on July 10 the road to Paradise Valley was ready for motor traffic. Prior to the opening of the road to Paradise Valley, of course, visitors reached the inn by tramping or riding their horses over the snow.

I have already mentioned that the trails were used to a greater extent than ever before. It was notable, also, that more ascents of Mount Rainier were made this year than were ever made in a single previous season, about 400 people climbing to the summit. A difficult climb was made by a party led by the superintendent, who chose the route selected by Lieut. A. V. Kautz in 1857. The total climb was 10,800 feet, and was made on June 27, 1920.

MOUNT RAINIER TAKES THIRD PLACE.

It has now been officially determined by the United States Geological Survey that Mount Elbert, Colo. (14,420 feet), ranks second to Mount Whitney (altitude 14,501 feet), which is the highest mountain in the United States proper. This places Mount Rainier (altitude 14,408 feet) in third place. Nevertheless, neither Mount Whitney nor Mount Elbert is as imposing a mountain as Mount Rainier, nor do they offer the same opportunities for thrilling sport in climbing.

RECESSION OF NISQUALLY GLACIER.

In the superintendent's report, printed on page 276, there are some extremely interesting data on the recession of Nisqually Glacier. In 63 years this glacier has receded 2,315 feet, the average being 37 feet per year, but for the last 28 years the average annual recession has been about 50 feet.

EXTENSION AND ADJACENT GAME PRESERVES STILL URGED.

I renew my recommendation that the region about the Ohanapecosh Hot Springs, near the southeast corner of the park, and other small areas along the south boundary be added to the park. Likewise, I again call attention to the urgent need of game preserves along the park lines. Last year there was a greater slaughter of deer outside of the park than has taken place for many years. There is no object to be gained by carefully protecting wild animals in the park if as soon as the snows come they are compelled to go outside and be killed.

SUPT. TOLL RESIGNS.

I exceedingly regret to record Supt. Roger W. Toll's resignation from the service. He has had a most successful administration, and has probably done more than any other official to encourage the use of the trails and the climbing of Mount Rainier.

His report for this year is full of constructive suggestions and is worthy of the most careful reading.

CRATER LAKE NATIONAL PARK.

So far as travel, climate, road, and trail conditions, and official protection and maintenance of the park were concerned, the Crater Lake season of 1920 was the most successful of its history. As a matter of fact, nothing but good news can be recorded of every factor of operation, except the conduct of the hotel and camp accommodations, which was thoroughly bad.

TRAVEL HEAVIER THAN EVER.

Travel to Crater Lake Park has each year shown a healthy increase over the previous year, and again this season we have a most gratifying increase over last year, despite the gasoline shortage and other circumstances that threatened several times to discourage or curtail long tours by automobile. It was noted also that motorists were more inclined to stop over in the park, and camp with their own outfits longer, than it has heretofore been their custom to do. There certainly exists here a splendid opportunity for the development of interest in camping and fishing, but to get the very best results in encouraging this use of the park the Diamond Lake area should be added. With a road from Crater Lake to Diamond Lake the park would become at once one of the best recreation areas of the Pacific coast and would be patronized by motorists from Canada to Mexico.

INCOMPETENT MANAGEMENT OF HOTELS.

Although this is the first year I have recorded the fact in print, the management of the Crater Lake Lodge and Anna Springs Camp has never been satisfactory to me. When I first visited the park in 1915 I found an attractively planned but unfinished hotel, especially far from complete within the structure, insufficient furnishings, a scanty larder, and very ordinary dining-room service. I observed that the plant was not being operated at a profit, and upon inquiry found that the owner had invested all of his available funds in the enterprise and was unable to secure more financial assistance.

PROMISES WITHOUT PERFORMANCE.

I endeavored to help him by offering suggestions regarding inexpensive improvements that would better service and make visitors to the hotel more comfortable, while further efforts were made to secure financial aid to complete the building. I secured the services of an experienced hotel operator, who visited the park and suggested perfectly feasible yet inexpensive betterments in kitchen and dining-room service. There were always promises of action on the suggestions and bits of advice, but no improvements worthy of the name were made. Year after year I visited the park, found the usual indifferent service and unfinished accommodations. I pleaded for improvement, got more promises, but never any fulfillment of agreements or understandings.

MORE PROMISES BUT NOTHING MORE.

Last year I visited the park with the National Editorial Association, and although the number of members of this party was well known months before, as well as the time they would spend at Crater Lake, the management was entirely unable to care for the party in a satisfactory manner. Again I remonstrated with the owner and got more promises, only to find absolutely no compliance a year later when, last July, I visited the park with the Appropriations Committee.

Conditions this year were worse than last season; certainly no better in any respect. I concluded the time had come for action, and accordingly I gave the owner of the hotel property notice that recommendation would be made for the cancellation of his franchise, and that the park would only be kept open for motorists bringing in their own equipment. This had the effect of materially improving service for the remainder of the season, but I feel that a change in the operation of this enterprise must be made.

GOV. OLCOTT TAKES A HAND.

Agreeing entirely with my stand, the governor has now appointed a commission to look into the status of the Crater Lake utilities with the idea of gathering all facts bearing on the situation, and then working out a practicable plan of securing improvements next year. My hope is that with the results of this study available funds can be raised in Oregon to purchase the property of the present owner of the Crater Lake utilities and to rehabilitate the enterprise, the parties subscribing the funds to organize and operate in much the same way as similar groups are now organized for the development of the Yosemite and Mount Rainier properties.

GOOD ROADS AND TRAILS.

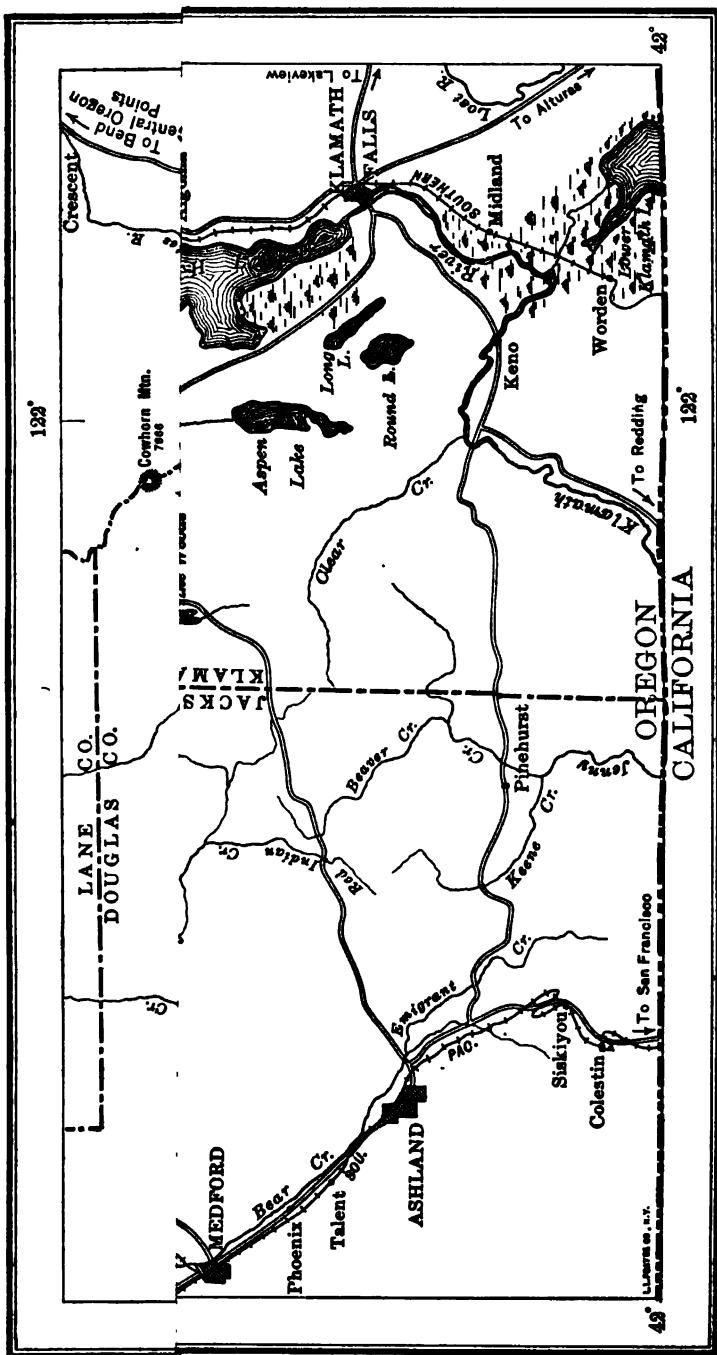
Roads and trails in the park were in good condition throughout the summer. The roads were opened this year earlier than ever before, the edge of the crater at the Lodge being reached on June 26, and the rim road being completely opened on July 26. There are now 57 miles of roads and 34 miles of trails in Crater Lake National Park.

OUTSIDE ROADS ROUGH.

The roads leading to the park from both the east and west slopes of the Cascades were rough and extremely dusty in places. Although both of these highways are slated for improvement under the Federal-aid road act, conditions of which I have no knowledge have so far caused reconstruction work to move forward very slowly. However, the existing roads should not discourage any motorist who wants to see and enjoy the wonders of the park.

TRANSPORTATION SERVICE.

Auto stage service to and from the park was operated in a generally satisfactory manner during the season, but not enough cars were available to give tourists the side trips they desired to make from



MAP SHOWING THE PROPOSED ENLARGEMENT OF THE CRATER LAKE NATIONAL PARK.

the hotel, especially along the rim road. More cars must be held in reserve at the rim next year.

Boat service was better than usual this year, more boats being in commission than during any previous year. In my opinion the National Park Service should soon build a dock on the shore of the lake sufficiently large to accommodate several passenger launches at one time. An estimate for this work has already gone forward to you.

STILL NO DIAMOND LAKE EXTENSION.

For several years I have been advocating the addition of the Diamond Lake region and Mount Thielsen to Crater Lake Park. Bills to accomplish this result have been pending in Congress many months. S. 2797, the Senate bill, was passed by the upper House of Congress on April 5, 1920.¹⁶ It is now pending in the House, where it will receive consideration in the light of objections filed by the Forest Service, which claims that the extension area is more valuable for commercial use of one kind or another than for recreation uses of those who visit the park.

I can not too strongly urge the enactment of this legislation into law. Should this be done it would be the policy of the service to build a road and excellent trail from the crater to Diamond Lake, which could be done without great difficulty. This would open to the motorist a splendid camp ground with ample water. Diamond Lake is shallow and affords excellent bathing opportunities along its wide sandy shores, while in the center of the lake fishing is good. It is ideal from the camper's standpoint, and should from now on be used as a tourist resort complementing Crater Lake.

FISH AND GAME.

Fishing has been good in the lake this year, many large trout being taken by enthusiastic anglers. Smaller animals have been numerous, but bears, always attractive and interesting to the tourist, have been scarcer this year than usual. Many were probably driven down last year by early snows and killed outside the park. Likewise, many deer were killed. As I have often urged, a game preserve should be established by the State around the park.

ROCKY MOUNTAIN NATIONAL PARK.

Although travel this year to Rocky Mountain National Park increased 42 per cent over that of last season, reaching the enormous total of 240,966 visitors, the outstanding event of the year was the completion of the Fall River Road connecting the east and west sides of the park. This road has been in the course of construction for many years, having been surveyed and partly built prior to the establishment of the park. While not ready yet for general automobile traffic, the east and west sections have been connected on the top of the mountains, and cars can now freely pass over the entire distance between Estes Park and Grand Lake. When the 1921 season opens, however, there will not be sufficient finishing touches to be put

¹⁶ See committee report on p. 378.

on the road to interfere with traffic. There remains to be performed the relocation of 5 miles of road on the Grand Lake end of the highway, which is now in poor condition, and the extremely bad curves and narrow sections of the eastern portion of the road where it ascends from Horseshoe Park should be improved by the State. The State, however, considers that it will have fulfilled its agreement with the Federal Government when it finishes the Grand Lake work, and doubtless the widening and rebuilding of the switchbacks on the east side will have to be done by the National Park Service.

HIGH-LINE ROUTE UTILIZED.

As recommended in my 1918 report, the Colorado State Highway Commission adopted and followed the "high-line" route for this road, building it to the top of the mountains, thence along the flat summit to the Continental Divide, where it starts the descent through Milner Pass. The route first chosen contemplated a road down Chapin Creek to its junction with the Cache la Poudre River, thence up the river to Poudre Lakes and Milner Pass.

This route was vastly less scenic than the high-line survey, and it was a wise thing to abandon it just when this action was taken. Approximately \$162,000 has been expended by the State on this road.

A GREAT CIRCLE TRIP.

The opening of the Fall River Road affords a wonderful circle trip that will compare with any similar trip in the world. This will begin and end at Denver, and will take the visitor across the Continental Divide twice. Leaving Denver the tourist will naturally go first to Rocky Mountain National Park, thence over the Fall River Road to Grand Lake, thence via Granby and Berthoud Pass back to Denver. The total distance will be 213 miles. At one point in Rocky Mountain Park the traveler will ride in his automobile at an altitude of 11,797 feet.

WONDERFUL TRIP TO GRAND LAKE.

I recently spent several days in the park, riding over its roads and trails, and I was more impressed than ever before, not only with the magnificent scenery its mountains afford, but with the importance of the park to the people of this Nation, because of its accessibility and splendid climate. That it is now used by nearly a quarter of a million people should be very gratifying to all concerned with the operation of the park, but it is clearly apparent to anyone who thoughtfully surveys its opportunities that as a tourist resort it is just beginning its career of usefulness.

I rode to Grand Lake from Estes Park and returned to the latter point, going via the Fall River Road and returning via Flattop and Bear Lake, making a side trip to beautiful Lake Nanita on by return trip. It was one of the finest mountain trips that I have ever experienced. One of these routes hereafter can be traversed by automobiles, and it is a fine thing to contemplate the pleasure that motorists from all over the Nation will derive from their Rocky Mountain visit, as they pass over the mountain amid the peaks and eternal snows.

APPROPRIATION INCREASED, BUT NOT ENOUGH.

In the last sundry civil bill Rocky Mountain National Park was granted an appropriation of \$40,000, four times its previous annual appropriation, but \$100,000 less than we felt it should have in order to initiate and move forward a reasonable number of essential improvements. However, with this fund it has been possible to perform considerable maintenance work on roads long neglected by the State for various reasons and by the park service because of lack of funds.

Expending the new appropriation wisely and with careful adherence to a policy of strict economy, the superintendent has been able to acquire considerable road-maintenance equipment and tools and has performed repair and improvement work on all of the highways in the order of their needs. Most attention was accorded the Glacier Basin Road, in order to better develop the public camp-ground facilities. This road also makes Loch Vale, Glacier Gorge, and Bear Lake more accessible, as it ends only a short distance from each of these beautiful sections of the park.

BIG THOMPSON CANYON ROAD REBUILT.

During the winter the State and Federal Governments, cooperating under the Federal-aid road act, widened the Big Thompson Canyon Road, and it is now possible for automobiles to comfortably pass each other anywhere along this highway. The engineering work accomplished on this project was of the best, and the highway commission may well be proud of its achievement.

The approach roads from Longmont and Lyons, as well as from Boulder, have been kept in splendid condition this season, and the work of widening the South St. Vrain approach has been progressing satisfactorily.

PARK ROADS PLANNED.

Estimates are being submitted now for the partial construction of the road on Trail Ridge, running out from Fall River Road, that I discussed in last year's report, and also for the beginning of work on the Fern Lake Road, as well as improvement of the switchbacks on the Fall River Road.

Other improvements that should be made at once include repairs and extensions of the telephone lines, new trails, and several new ranger stations.

ACCOMMODATIONS INCREASED AND MORE NEEDED.

Although hotels and chalets in the park were enlarged to accommodate 400 additional guests and a new hotel camp, with a capacity of 160 guests, was erected in the park near Grand Lake, there was a scarcity of rooms throughout the summer. Further enlargements are certainly essential if visitors to the park are to be properly cared for.

TRANSPORTATION LINE WELL MANAGED.

Another year's operation of the transportation line has still further proved the wisdom of establishing this public utility, with the obligation to care for all hired-car business in the national park.

The line has rendered extraordinarily fine service at reasonable rates. Its cars have been driven by careful drivers, and all patrons have had comfortable, pleasant trips. With the exception of criticisms by individuals opposed to the established policy of public-utility franchises, no complaints against the transportation line have come to my attention.

FIRST GATEWAY CONSTRUCTED.

Frank S. Woodward and Mrs. Woodward, of Denver, have generously erected for the park an exceedingly attractive gateway. This marks the eastern or Estes Park entrance, and was built on land donated by Dr. and Mrs. E. H. James. I wish to record here our grateful acknowledgement of these patriotic gifts.

MOUNT EVANS WORTHY PARK AREA.

Although no action has been taken this year looking toward the addition of the Mount Evans area of approximately 100 square miles to the Rocky Mountain National Park, I believe that this project should ever be regarded as a meritorious one and should be ultimately given the favorable consideration of Congress.

MESA VERDE NATIONAL PARK.

From the standpoint of tourist use of the park, Mesa Verde has just closed its most successful season. Never before did it have as many visitors as entered its gates this year. When the season opened, inadequate train service and bad automobile roads discouraged travel in the direction of the park, but these conditions were soon improved, with the very gratifying results just noted.

NEW ROADS AND TRAILS.

Small appropriations precluded the performance of much improvement work aside from that involved in bettering existing roads and trails to the principal points of interest. A short road was constructed this year from Sun Temple to a spectacular point on the rim of one of the near-by canyons, thus affording a most unusual view of the ruins, the canyon, and the forests. Also three trails have been built, all filling long-felt needs of the visitor who delights in exploring this fascinating region. One trail leads from Cliff Palace to Community House in the canyon below, another takes the traveler from Spruce Tree Camp to the western border of the park where the Rock Springs group of ruins is to be seen, and the third trail skirts the southern end of Chapin Mesa.

Spruce Tree Camp, the only establishment for the accommodation of tourists in the park, has been further improved this year by the addition of a bathhouse and by the improvement of the water supply.

THE MUSEUM HAS BIG FUTURE.

The museum is growing in importance each year as new exhibits are added. When funds are available to enlarge the present structure and provide fireproof protection for valuable relics, it is my hope that many of the Mesa Verde exhibits now in storage in Washington

or in private collections in different sections of the country may be restored to the park by gift or by loan. There is an opportunity, then, and a duty, to make this museum something that will attract the interest and stimulate the pride of the Nation.

NEW FIRE TEMPLE EXCAVATED AND RESTORED.

Archæological work was continued this year under the direction of Dr. J. Walter Fewkes, chief of the Bureau of Ethnology of the National Museum. Funds for his excavations and other field work in the park were supplied by the National Park Service. Dr. Fewkes devoted himself this year to the excavation and restoration of what has been called Painted House. It has always been regarded as an ancient dwelling house, and received its name from the fact that on its walls were an unusual number of ancient paintings. The studies of the past summer, however, have disclosed the interesting information that this was the building in which the sacred fire was constantly kept burning. From this place fire was taken to renew the fires that for one reason or another had been extinguished in the other houses of the community, or to start entirely new fires as needed. This discovery prompted the change in name of this important ruin to New Fire Temple. Shortly Dr. Fewkes will publish the details of his findings in New Fire Temple.

ARCHÆOLOGICAL WORK OF THE FUTURE.

The work of excavating the ruins of Mesa Verde National Park has scarcely begun. It is true the large cliff dwellings have nearly all been examined. These, of course, are in the canyons. On the other hand, on the mesa there are scores of mounds under which whole villages are buried, and it would be most desirable to progressively excavate these mounds under cooperative arrangements similar to those we have heretofore been able to make with the Smithsonian Institution.

ROAD EXTENSION PROJECTS.

However, even more important than the need of further archæological work is the necessity for extending the road system. In my last report I urged the appropriation of funds for the construction of a road from the present Chapin Mesa Road, which connects most of the large cliff dwellings now accessible with the Cortez-Shiprock Highway south of the park. This project involves some construction work in the Southern Ute Indian Reservation. When this road is built it will be possible to go directly to the Mesa Verde from Gallup, N. Mex. Thus this park would be placed squarely on the Park-to-Park Highway. This is the first new road that should be built, but a highway from the head of Chapin Mesa to the ruins on Wetherill Mesa should be undertaken at an early date.

ZION NATIONAL PARK.

I have just returned from my second trip to Zion National Park within the year. On the occasion of my last visit the park was formally dedicated with appropriate ceremonies. Addresses were made at the dedicatory exercises by prominent citizens of Salt Lake City

and other Utah communities. The beautiful autumn weather, combined with good road conditions, made the celebration of the establishment of the park especially pleasant for all participants.

THE ESTABLISHMENT OF THE PARK.

Zion National Park was created by act of Congress approved November 19, 1919.¹⁷ In my last report I described the legislation then pending, and in Appendix D thereof quoted in full the department report on the bill. It happened that the measure was enacted into law while I was on a western trip, and it was my pleasure to announce, in several sections of the State, the establishment of Utah's first park.

Prior to its reservation as a park the Zion Canyon region had been a national monument. The first monument proclamation was issued by President Taft on July 31, 1909, when the reservation was called the Mukuntuweap Monument, the old Indian name of the canyon being used. The early withdrawal covered only 15,840 acres of land. On March 18, 1918, the monument was enlarged to 76,800 acres, and the name was changed to Zion, the new designation being especially appropriate because its principal accessible feature in the early days had been called Little Zion Canyon by the Mormon settlers, who used it as a place of refuge on occasions of Indian troubles. The park legislation merely changed the character of the reservation, there being no increase in its size.

APPROPRIATIONS FOLLOW PARK'S CREATION.

After the establishment of the park Congress authorized a beginning of its improvement by appropriating \$7,300 for expenditure during the 1921 fiscal year. Under this appropriation all work planned could have been accomplished had it not been for disastrous rises in the river (the North Fork of the Virgin), which seriously injured the main road in several places, besides destroying an important bridge which cut off access to Little Zion Canyon for a considerable period of time. This unfortunate event resulted in substantially curtailing park travel, and to repair the damage funds had to be diverted from other exceedingly important projects.

SUBSTANTIAL PROGRESS ALREADY EVIDENT.

Notwithstanding this setback, the establishment of the park and the appropriation of Federal funds for its upkeep and improvement have wrought great changes for the better in this remarkable region. The public announcements of the creation of the park focused attention on it, and stimulated travel to it, and the funds now available have enabled the service to extend the trails, improve the roads, develop camp grounds, protect the upper country as well as Little Zion Canyon, and otherwise bring about results beneficial both to the park and to the traveling public.

STATE PRIDE HELPS.

The State has always taken a deep interest in this park. Not only has it rebuilt and splendidly maintained most of its roads leading

¹⁷ See text of organic act in Appendix D.

into the park, but it has also done everything within its power to aid the National Park Service in its undertaking to protect and promote the new playground. During the year the State established a game preserve north and east of the park, and already a greater abundance of deer and other animals has been observed by the superintendent and others familiar with park conditions.

Utah is proud of her scenic possessions and appreciates them. The creation of a national park in one of her colorful scenic regions of the first order has encouraged Utah capital to improve hotel and transportation facilities and promote better roads in the southern part of the State. Funds are now being raised for the erection of a first-class hotel at Cedar City, from which roads radiate in all directions into mountain and desert. Likewise, St. George, Panguitch, and Hurricane are preparing to entertain tourists in new and up-to-date hostelries and furnish them with other facilities that will leave nothing to be desired.

SALT LAKE CITY—PARK GATEWAY.

Salt Lake City, long a great tourist center, is also alive to its opportunities in the park region of the southern part of the State, and is lending its powerful aid wherever it is needed. Los Angeles, too, has not failed to recognize that she is a gateway to scenic Utah, and is preparing to assist in the opening of this territory as a tourist motor land.

Only a short time will elapse before Zion National Park will be known as one of America's greatest scenic resorts and will be visited by thousands. New roads and trails will have to be built, and every other improvement necessary in the accommodation and entertainment of visitors will have to follow as fast as money is available. These improvements constitute the Government's obligation.

WIND CAVE NATIONAL PARK.

In spite of a very late spring and unusually bad weather in the early summer, the current season was the most successful in the park's history. The number of visitors to the park this year shows a slight increase over the record season of 1919; and while the private automobile travel decreased this was more than offset by the increase in train travel.

NO FUNDS—NO IMPROVEMENTS.

As in the case of other parks, lack of funds has made it impossible for the service to accomplish any improvements, and even maintenance work has had to be slighted because money was not available to perform all necessary repairs to buildings and equipment.

NEW BRIDGES ABSOLUTELY NECESSARY.

The bridges of the park roads are in a state of complete dilapidation and should be replaced by new structures immediately, and an estimate for these improvements is being submitted in the budget for the 1922 fiscal year.

As urged in former reports and in hearings held by the committees of Congress, it is necessary that the annual appropriations for this

park be increased to a figure that will enable us in the course of a few years to make the reservation, and particularly the cave—its central feature—more accessible and hence more useful to the public, while also bringing present improvements to a state of repair consistent with safety to travel and economy of management.

THE BLACK AND YELLOW TRAIL.

A new transcontinental highway, designated the Black and Yellow Trail, is being developed by a very active group of far-seeing Middle West citizens. This trail leads across South Dakota into the scenic Black Hills region, thence through Wyoming across the Big Horn Range, with its destination Yellowstone National Park. Aside from the scenic mountain region that this trail will traverse, its historic associations will attract a multitude of motorists. The Wind Cave Park will be one of the main features of the trail, although located a short distance south of the designated highway.

The State of South Dakota at the present time is taking a great deal of interest in its parks and is spending large sums of money in improving its Custer State Park, not far from Rapid City. Here a big game preserve has been established and other improvements are being made under State appropriations vastly larger than any heretofore made by Congress for Wind Cave Park.

The point I want to emphasize, however, is that this national park is destined to figure importantly in transcontinental travel, probably within a very short time, and unless it has more funds for improvement than it has had in the past it will reflect discredit rather than credit upon the Federal Government when compared with the State park and highway improvements to be observed in its immediate vicinity.

GAME PRESERVE.

The United States Biological Survey maintains the game preserve in the northwestern part of the park, containing 4,160 acres under fence. The preserve now contains 187 head of big game, which is an increase over the preceding year. These include 60 buffalo, 105 elk, 20 antelope, including 6 young, and 2 deer. The game have prospered this season due to an abundance of feed and water in the pasture. The past year, however, was unusual in respect to water, as in previous years it has been necessary to conserve the water supply. In further improvement of the park the development of an adequate water supply is most important, and to insure this an Executive order¹⁸ was issued July 14, 1920, temporarily withdrawing public lands bordering the northeast corner of the park, which contain several springs and other sources of water supply.

LAFAYETTE NATIONAL PARK.

The first national park to be established within the original United States, Lafayette National Park, lies on the New England coast on Mount Desert Island, a region that was once a portion of the old French Province of Acadia, a region that was explored and named by Frenchmen and was occupied for a century by France. Orig-

¹⁸ For Executive order, see p. 370.

inally the Sieur de Monts National Monument, it was given national park status February 26, 1919, the act creating it having the signal honor of passing both the House and Senate unanimously.

INCREASED TOURIST TRAVEL.

The marked feature of this year has been the steadily increasing flow of tourist travel to the park. Many of the tourists come with motor camping outfits, the method of travel more often found in the West than in the East, from other and often distant States. For such parties the park offers unlimited opportunity, while the roads leading to it along the Atlantic coast and from the New Hampshire mountains are being steadily improved by the State and towns. The whole of New England is interested in furthering such travel, and a plan is now under consideration for marking important through routes leading to the park from other centers with a special, easily recognizable national-park sign that can be placed as needed in association with other signs along other highways leading elsewhere but forming through routes to the park for a portion of the way.

It has been estimated that 66,500 persons have visited the park the past season, only a fraction of whom signed the park register placed at the Bar Harbor entrance to the park. This register, however, shows tourists coming from 29 States. The hotels and coast resorts surrounding the park have had a full and crowded season, so much so that additional hotel space to take care of the increased travel is needed. Plans for a large new modern hotel at Bar Harbor upon a magnificent site on Frenchman Bay have been prepared, and this hotel will be constructed in the near future.

IMPORTANT GIFTS.

The original 5,000 acres, comprising first the monument and later the national park, were a gift to the Nation. By the act creating the park you were authorized in your discretion to accept in behalf of the United States other property on said Mount Desert Island, including lands, easements, buildings, and moneys as may be donated for the extension or improvement of the park. During the past year the park has steadily grown by important gifts, which are an indication of the warm interest which the park inspires. These gifts differ widely. One such will give the park nearly a mile of additional wild and beautiful ocean front; another comprises the greater portion of the shores of a State-owned lakelet, and includes St. Georges Hill, the view from which has long been famous locally; the third gives the park a brook ravine, that of Duck Brook, which for two generations has been a favorite walk from Bar Harbor, and will now make a delightful and appropriate entrance to the national-park area. Further gifts assure important features of the immediate entrance from Bar Harbor, bringing the park lands down to meet the highway and to border on the beautiful, far-stretching golf links for which Bar Harbor is now famous. These gifts are now in preparation for acceptance by the Government, waiting only for the clearance of the titles.

Another interesting gift, but of a far different character, to the park has been that of letters bearing the signature of Henry IV of

France, who gave De Mont his commission for the founding of Acadia, which lead to the discovery and naming of Mount Desert Island by Champlain in 1684; of Louis XIV, who gave the island two generations later to Antoine de la Mothe Cadillac, the founder of Detroit, to whose granddaughter the Commonwealth of Massachusetts freely reconveyed its eastern portion in 1788. A large number of the deeds to the present national-park land proceeded directly from her, and bear the signature Marie de Cadillac.

A WILD-LIFE SANCTUARY.

The wild life of the park has been increasing and seems to realize already the protection afforded by the national park due to the excellent efforts of the ranger force. A herd of over 40 deer wintered in the park and during the heavy snows hay was sledged in to them. Five beaver have been presented to the park by the Fish and Game Commission of Maine; 4 having successfully established themselves, and 2 young beavers, apparently their offspring, have been reported by one of the rangers. The ruffed grouse has increased largely within the past year; wild ducks wintered in large numbers and wild geese also sheltered in the waters of the park during their migration in the fall. The State fish and game commission, at the State's expense, is employing a warden strictly to enforce its laws upon Mount Desert Island and to cooperate with the park in the establishment of a true wild-life sanctuary within its bounds.

FUNDS NECESSARY TO PROPERLY DEVELOP.

Funds available during the fiscal year ending June 30, 1920, permitted only of administration, protection, and maintenance, and little could be done under this in new construction. Work along such lines was still rendered possible in special instances, however, by the interest of the citizens, and good progress has been made in path construction and since July in the commencement of the new year's work. The lands now belonging to Lafayette National Park, or now in process of acceptance by the Government, stretch for a distance of over 15 miles from east to west. There are a dozen distinct mountain peaks divided by gorges, lakes, and streams; there are meadow lands and extensive woodlands, and there are portions with wide ocean frontage. Over this territory there are scores of miles of old trails to be maintained; there are new paths urgently required to be built; there are roads and bridle paths to be built; there are ranger huts to be provided; more adequate fire protection to the forest areas is needed; and surveys are needed to clearly delimit the park area where it meets private lands. To accomplish these things larger appropriations commensurate with the growing importance of the park are necessary.

WINTER SPORTS.

An unusually keen interest has been developed in winter sports. During the Christmas holidays opportunity for ice boating and skating afforded by Eagle Lake was improved to the fullest extent. Shortly after the first of the year the snow fell heavily and ice sports gave way to snowshoeing, skiing, and tobogganing. Snowshoe parties could be seen daily enjoying the wooded roads and trails

in the park, and the more difficult trails up the mountains became popular objectives of the adventurous. The park lands are ideal for the full enjoyment of this sport. The broad valleys, usually accessible from any portion of the island, offer unlimited opportunities to its devotees. Prior to last winter skiing was almost unknown on Mount Desert Island; since then, however, this form of winter sport has also come to the fore. Excellent opportunities for the construction of skiways and toboggan slides are offered by the park land at a minimum expenditure. With the development of these winter sports Mount Desert Island and Lafayette Park will indeed be as popular resorts for winter tourists as they are now for summer.

HOT SPRINGS RESERVATION.

The most notable event of the year in Hot Springs Reservation affairs was the beginning of construction of the new Government free bathhouse, which I have discussed in my last two annual reports. The ground for the new structure was broken on January 31, 1920, by the Assistant Secretary of the Interior, appropriate ceremonies accompanying this initiation of construction work.

COL. JOHN R. FORDYCE, PATRIOT.

The supervision of the erection of the building is the personal work of Col. John R. Fordyce, son of the late Samuel W. Fordyce, one of the pioneers of Hot Springs and a man who had more to do with the advancement of the reservation as the great national spa than any other individual. Actuated by a desire to carry on his distinguished father's work, and to do honor to his memory by a special service to the park, Col. Fordyce, at the National Parks Conference held in Denver last November, tendered his services for Government improvement work at Hot Springs. I accepted his offer and arranged with the department for his appointment as consulting engineer of the National Park Service at a salary of \$12 per annum, later assigning to him full charge of the biggest construction project we had in hand, the building of the free bathhouse, which had been authorized by acts of Congress mentioned in previous reports.

MORE APPROPRIATIONS NEEDED FOR FREE BATHHOUSE.

While the erection of the new bathhouse is progressing very satisfactorily, it is already evident that the appropriations available are wholly inadequate to complete the plant. Col. Fordyce estimates that the additional funds required will total \$110,565, and this amount will be requested in a deficiency estimate to be submitted upon the convening of Congress. In view of the decision to erect the bathhouse by day labor under Col. Fordyce's supervision, and thereby save contractor's profits, it was necessary to obtain a reappropriation of the funds provided for this project, and this authority to use them in the current fiscal year was included by Congress in the last sundry civil act.¹⁹

¹⁹ See text of authority in Appendix D, p. 386.

INDIGENT SICK RECEIVE VAST NUMBER OF BATHS.

The importance of the free bathhouse and the necessity for its being placed in commission at the earliest practicable date are clearly evident upon consideration of the fact that during the 1920 fiscal year 100,669 baths were given to indigent sick in the dilapidated old bathhouse which the new structure will supersede. This figure represents an increase of 13,629 baths over those given in 1919. The average number of indigents bathed daily during the last fiscal year was 327.

Not only will there be opportunity in the new bathhouse to bathe a very large number of indigent people as compared with those handled in the old establishment, but the new facilities will be absolutely sanitary and in every way up to date, whereas the old building to be abandoned was small, insanitary, and utterly incapable of rendering the service that it is the duty of the Government to furnish to the poor unfortunates who seek the health-giving waters of the reservation as their last resort.

HOUSING OF INDIGENTS PROJECTED.

Meantime I am giving such time as I have available to the development of interest in a comprehensive housing plan to provide sleeping accommodations and facilities for feeding the indigent who visit the park in search of improvement of health. This is not an easy thing to accomplish, but with the aid of individuals and organizations already engaged in social service activities I hope something tangible may come out of the ideas that have been expressed, discussed, and studied.

Of course, any feasible housing plan that may be adopted ought not to be carried out by the Federal Government. All funds from the National Treasury appropriated for the park ought to go into its further improvement as contemplated by the comprehensive development program submitted in 1918 in accordance with the directions of Congress.

MORE IMPROVEMENTS IN ORDER.

In my 1918 report I briefly described the main features of this program. The free bathhouse, the most pressing need of the park, is now on the way to completion; the administration building improvement has been authorized, but more funds are required for performing the construction work involved; and an estimate for the comfort stations to be erected on the reservation front has been compiled. Next year the comfort stations should be constructed, and in all likelihood the owners of the bathhouses that must be reconstructed will be able to marshal the finances required to make their improvements.

ROAD EXTENSION PLANNED.

It is proposed to cooperate with the city of Hot Springs in the construction of a road to the top of West Mountain, provided funds can be procured. This is a most desirable road project and when completed will add greatly to the attractiveness of the park from the standpoint of the motorist. As Hot Springs is coming more and

more to be a pleasure park as well as a health resort, we must give attention to roads and trails. Following the West Mountain Road improvement the Gorge Road should be built. This, it will be recalled, is a part of the comprehensive plan for landscape development of the reservation.

PARK EXTENSION POSSIBLE.

Recently there has been discussion of a possible extension of the park to include forest areas lying between Hot Springs and Mountain Valley with the idea of ultimately constructing automobile roads in this region and opening up extensive camp grounds. How feasible this suggestion is I do not know, but the idea will be thoroughly investigated.

We consider Hot Springs Reservation a park and constantly speak of it as such, but it is desirable that congressional authority for a change in name be secured and legislation to accomplish this end is ready now for submission in the annual estimate, as follows: "Hereafter the Hot Springs Reservation shall be known and designated as the Hot Springs National Park."

THE BUSINESS OF THE YEAR.

Aside from the fact that more people visited Hot Springs Reservation during the past year than ever before, the bathhouses enjoyed unusually heavy patronage. The total number of baths sold was 870,731, as compared with 729,997 in 1919, a gain in the 1920 fiscal year of 140,734 paid baths. The gain in net profits of the bathhouses over the 1919 figures was \$100,200.68. The total number of baths given in all the bathhouses, including the charitable institution, was 978,772, a gain of 154,446 over the previous year.

MORE REVENUE ASSURED.

The reservation is assured of increased revenue by the following legislation contained in the 1921 sundry civil act:

The Secretary of the Interior is hereby authorized to assess and collect from physicians, who desire to prescribe the hot waters from the Hot Springs Reservation, reasonable charges for the exercise of such privilege, including fees for examination and registration; and he is also authorized to assess and collect from bath attendants and masseurs operating in all bathhouses receiving hot water from the reservation, reasonable charges for the exercise of such privileges. The moneys received from the exercise of this authority shall be used in the protection and improvement of the said reservation.

Regulations putting this legislation into effect were promulgated early in July.

PLATT NATIONAL PARK.

With a slight increase in the annual appropriations for Platt National Park, in Oklahoma, the service has been able to make improvements and purchase equipment to take care of some of its most crying needs. The sewer system has been extended and facilities for performing more maintenance work have been purchased. It has been difficult, however, to keep the park from retrograding, because so many things had to be neglected last year when the annual appropriation was cut to \$6,000. The superintendent on

several occasions last year found it necessary to use his personal funds to make minor improvements, steps that he should not have been obliged to take under any circumstances.

ELK AND BUFFALO INTRODUCED.

In the course of the year elk from Yellowstone Park and buffalo from the Wichita National Game Preserve were liberated in the park, and it now takes its place as an important game preserve. The expenses of transferring the elk and buffalo were defrayed by subscriptions of funds on the part of public-spirited and generous Oklahoma citizens.

Automobile camp grounds have been much enlarged and improved during the past few months, and on this account it is to be expected that the park will become even more popular as a resort for motorists than it now is.

Antelope and Buffalo Springs, which mysteriously ceased to flow in January, 1918, resumed their activity in the early spring of this year. Their combined daily discharge of water is 5,000,000 gallons.

While the current sundry civil law was under discussion on the floor of the House of Representatives in May, 1920, an effort was made to transfer Platt National Park to the State of Oklahoma on the ground that it did not possess sufficient features of national importance or interest to warrant its maintenance as a national park. However, the suggested change of status was not given favorable consideration by either House of the Congress.

Since the last annual statement regarding the affairs of this park was compiled, a total of 40,251 gallons of bromide water, 10,657 gallons of medicine water, and 5,383 gallons of sodium-chloride water were taken from the reservation by visitors. These figures show the extent of the use of this park by the public, aside from the recreational features enjoyed.

SULLYS HILL NATIONAL PARK.

An important game preserve is maintained in Sullys Hill National Park by the United States Biological Survey. This preserve, established in 1915, now contains 45 head of big game, including 7 buffalo, 32 elk, and 6 deer. This constitutes a representative collection of the big game once native to that territory and affords a large community an opportunity of seeing these animals living under natural conditions. All the animals are doing well, and the buffalo, and particularly the elk, have increased rapidly since the preserve was first stocked. Under appropriations made available for the maintenance and improvement of the game preserve the Biological Survey has completed a number of improvements. Parking grounds for automobiles have been cleared and cars admitted for the first time, and a water system installed. A new attractive entrance gateway is now being built.

The Sullys Hill Park will become increasingly important from the tourists' standpoint as the Theodore Roosevelt International Highway, extending from Portland, Me., to Portland, Oreg., is improved and developed.

HAWAII NATIONAL PARK.

On February 27, 1920,²⁰ the President approved the act authorizing the governor of Hawaii to exchange territorial lands for private holdings of equal value in Hawaii National Park. This opened the way for beginning the real operation of this wonderful volcanic reservation as a national park, because the organic act creating the park directs that until easements and rights of way over private lands have been acquired by the Government no appropriations for the maintenance and improvement of the park shall be made.

COOPERATION BETWEEN TERRITORY AND LANDOWNERS.

Under the new exchange law it was possible at once to proceed with the acquisition of all necessary rights of way and easements as well as practically all patented lands, because the Territory was deeply interested in the development of the park and was ready to trade lands owned by it for private holdings in the park, and, on the other hand, the owners of all private lands and rights of way desired were willing to dispose of these holdings on a reasonable basis, accepting territorial lands of equal value in exchange for their properties.

After the exchange law was enacted, I sent Field Assistant Albright to Hawaii to assist in the development of the exchange proposals, and also to study the needs of the park from the standpoint of maintenance and protection.

PARK REPRESENTATIVE IN THE ISLANDS.

He left San Francisco on March 8 and returned on April 13, spending three weeks in the Territory. He devoted the most of his time to studying conditions on the Island of Hawaii, where the Kilauea and Mauna Loa sections of the park are located, although he also made an examination of the Haleakala section of the park on Maui, and even spent two days on the Island of Kauai inspecting Waimea Canyon, which had been suggested as a possible addition to the park. His report is printed on page 339.

Reaching the undoubtedly correct conclusion that the National Park Service should first concentrate its energies on the improvement of the Kilauea section, the field assistant proposed no exchanges under the new law except those necessary to acquire private lands in that section.

TWO PROPOSITIONS AT KILAUEA.

Two exchange propositions were considered. One involved all of the Bishop estate holdings in and around the Kilauea Crater, except a triangular area including the volcano house and a tract which the estate had planned to subdivide and sell for summer homes. The area of the triangular tract was 650 acres. The second proposition involved part of this smaller tract.

LARGE TRACT EXCHANGED.

The larger tract, 11,837 acres in extent, had been offered for sale or exchange in 1916 on a basis of value set at \$52,820. Although land

²⁰ See text of act in Appendix D, p. 362.

values had advanced in the meantime, the trustees of the Bishop estate in March, 1920, again agreed to convey this holding to the Territory on the old valuation basis. The Territory on its part tendered to the estate about 900 acres of land at Mokakea on the island of Hawaii, this land being considered as of approximately the same value as the park lands, because the two tracts, while varying greatly in size, produced about the same annual returns measured in terms of monetary income. This exchange was approved in May by both parties, and as soon as the deeds are exchanged and other details settled, which will not require much more time, the transaction will be complete.

Based on this exchange, I am submitting to you an estimate for an appropriation of \$10,000 to establish an adequate supervisory and protective force in the Kilauea section of the park next year, and to also plan such new improvements as it seems advisable to make in the early future.

ANOTHER EXCHANGE TO FOLLOW.

Meanwhile the smaller exchange proposition advanced by the field assistant will be developed by the Territorial officials and the Bishop estate. This exchange will involve the transfer of the Volcano House property and enough of the land of Keauhou lying north of the main highway to the rim of Kilauea's crater and the Volcano House to make it possible for the service to forever preserve the forest growth. For this property Territorial lands of equal value will be exchanged, as in the case of the larger tract.

As noted in a previous report, all private holdings in the park section on the summit on Mauna Loa were donated to the Territory and therefore to the Federal Government.

HALEAKALA HOLDINGS INCONSIDERABLE.

We still have holdings to acquire in the Haleakala section, but it will not be necessary to negotiate for these lands immediately, and at no time will there be much land to acquire. Beyond a right of way to the summit of the mountain and into the crater, the only lands needed for park purposes comprise part of the two meadows at either end of the more or less rectangular-shaped crater, one near Koolau Gap, the other near Kaupo Gap. These lands the owners are willing to exchange under the new law.

KILAUEA SECTION COMES FIRST.

As already noted, however, I think it is our duty to concentrate for the time being on the development and protection of the Kilauea section, because far more tourists visit this section than go to the other two combined. This is the accessible section, and is the park area that has the greater variety of natural wonders for the tourists to use and enjoy. Here, also, is the headquarters for all scientific work in volcanology. We should improve this area first, and we must protect it. Vandalism is rampant and can not now be checked.

HELP HAWAII BUILD ROADS.

Besides roads, trails, and buildings to be built in the park, the service should, I think, urge the appropriation of funds for paving

the road to the park from Hilo, and for similar work on both national-park islands where the park areas would be benefited, even though the roads are not within park boundaries.

Two reasons should govern the consideration of this proposal. In the first place, Hawaii received no funds under the Federal-aid road act, and should be treated liberally on this account, and, in the second place, these roads approaching the park areas would be chiefly used by tourists from all over the world, and should therefore be Federal charges.

THE KAU FLOW.

The active volcano in Kilauea Crater, the "lake of fire," is probably the most sensational and wonderful natural phenomenon of the national-park system, and would be worth a trip of many thousand miles were the scores of other features of the park not to be seen. However, this year the park offered what might be termed two volcanoes. Out on the Kau Desert, about 6 miles from the fiery pit in Kilauea Crater, molten lava burst forth from a subterranean tube leading through a crack beginning at the wall of the main volcano. This flow of lava was called the Kau flow of 1920, and is still at work building up a new mountain. The flow really began in December, 1919. It has now built up a great mound almost 200 feet in height. This mound has been designated Mauna Iki (little mountain). The Kau flow was easy of access from the hotel, and hundreds of visitors saw its live stream of lava cascading over older flows and burning the brush. It was possible to approach to within a few feet of the lava and poke at it with a green stick.

THE ALIKA FLOW.

Another flow that was tremendously interesting to visitors occurred in late October, 1919. This did not occur in the park, but broke out on the west slope of Mauna Loa and ran down to the sea through the Alika lands of the Kona district. Hence it was called the Alika flow. It was a very spectacular flow of rough aa lava, but did not continue for many days.

PARK EXTENSION SUGGESTED.

The Kau flow, several ancient lava flows of great scientific interest, numerous earthquake and other cracks leading away from the Kilauea Crater and in the lands between the west and south boundaries of the park and the sea should all be included in the park. The wonderful Twin Craters and Thurston Tubes, not far from the road leading to the lava pit in the Kilauea Crater, should likewise be put in the park because they are distinctive features of the region that are of national interest. It is recommended that the new lines as suggested in the report on Hawaii Park, printed on page 339, be secured by appropriate legislation as soon as practicable.

MORE SHIPS FOR TOURISTS.

Hawaii National Park, and the entire Territory for that matter, needs much more consideration at the hands of the Government than it has had in the past. One of its greatest needs is more ships for

passenger transportation. The islands are national health and pleasure resorts, and would be visited by tens of thousands annually if ships were available. Because of our national park there, as well as the fact that the islands are under the general supervision of the Interior Department, I recommend that the department and the service take every opportunity to assist in improving transportation facilities to the Territory.

LASSEN VOLCANIC NATIONAL PARK.

On July 6 last, I visited Lassen Volcanic Park for the first time since its establishment under the act of Congress approved August 9, 1916. I made the trip with Mr. A. L. Conard, of Red Bluff, Calif., leaving that city at 6 a. m. and returning late the same night in time to meet the Appropriations Committee after its inspection of the Orland Reclamation Project. At the village of Mineral, near the park line, I met Forest Supervisor Dunstan of the Lassen National Forest, and one of his rangers, and conferred with them in regard to the protection and improvement of the park area.

PARK GETS ITS FIRST APPROPRIATION.

Congress made its first appropriation for the park by including in the sundry civil act of June 5, 1920, an item of \$2,500. Of course this sum was too small to justify the establishment of a national-park organization and attempt to accomplish any tangible results in improving the reservation. It was necessary, therefore, to seek the aid of the Forest Service in the protection of the area, and in my conference with the supervisor I arranged for the expenditure of the fund of \$2,500 in the improvement of roads and trails in the park. This work is in progress at the present time.

MOVEMENT TO ABOLISH PARK FAILS.

Nearly a year ago a movement was initiated by a group of citizens of northern California, some of them cattle and sheep growers, to have the park abolished and the land restored to the national forest reserve. Interest in the movement appeared to spread widely, largely on account of the failure of the Federal Government to provide funds for the maintenance of the park, but opposition to the idea soon developed among another group of Californians, who contended that even if Federal improvements had been postponed and should be further delayed, the park area was worthy of preservation in its natural state, and that the future would see it become a recreational center of great importance to the State and to the Nation at large. The latter group prevailed, and there appears now to be no faction or group seeking to have the organic act repealed.

ADEQUATE FUNDS NEEDED.

It is plainly the duty of the Congress to remove the \$5,000 inhibition on the annual appropriations for this park and give the service sufficient funds to make the reservation accessible, and give it proper protection; and I sincerely hope that legislation designed to accomplish both these ends will be approved in the course of the next year.

There have been no eruptions of the Lassen Peak Volcano since my last report, but there have been other indications of greater activity within the mountain than occurred during the past few years.

MOUNT MCKINLEY NATIONAL PARK.

Nothing in the way of progress can be reported in writing of Mount McKinley National Park. The situation of this great park and game preserve remains the same as discussed in the last three reports of this service. No appropriations have been made, no control of the park has been established, and it has had no protection aside from the incidental attention it has received from the ridiculously small game-warden force of the Territory of Alaska.

ALASKA RAILROAD BRINGS DANGER TO CARIBOU.

Meantime, the new Alaska Railroad comes nearer and nearer the park boundary. Soon it will approach close enough to the park to bring in people whose purpose it will be to slaughter the wild life of the region, especially the caribou and mountain sheep, animals that can not be preserved once they are brought near extinction. Furthermore, poaching is undoubtedly practiced in the park at the present time.

NEEDS OF PARK PRESENTED TO CONGRESS.

When the last sundry civil bill was under discussion in the House Committee on Appropriations, Mr. Charles Sheldon, a member of the Boone and Crockett Club, of New York, and one of the foremost game conservationists of this country, appeared before the committee, and after explaining in detail the characteristics of the caribou and mountain sheep which inhabit the park in great herds, made the following plea:

The railroad is going up there in that section, and the game hunters will be increasing up there very soon. It is really of vital importance that the game in the Mount McKinley National Park should immediately receive proper protection. It will require time to organize a warden service and get wardens installed in the park. Therefore I sincerely hope that the appropriation asked for the park will be granted. Otherwise it would be possible seriously to deplete the game there. As I have stated, one of the reasons why game has been reduced in the West is because proper protection was not given in time. Such lessons are particularly pertinent to the consideration of game right now in the McKinley Park, and I urge the granting of the appropriation.

No one knows conditions better than Charles Sheldon. Congress heeded his advice and that of other men who were familiar with Alaskan game problems when it established the park. The organic act was rushed through as emergency legislation, in order that the wild animals might be saved, and yet nearly four years have passed without a grant of funds to carry out the desires of Congress as expressed in the law.

BIG GAME ANIMALS MUST BE PROTECTED.

Something ought to be done, and done quickly, or the objects of Congress can not be attained. The caribou, the mountain sheep, the bear, and other big game animals will soon and suddenly pass away as the buffalo and antelope vanished from our plains. Our wild life

is fast disappearing, anyway, and the time is not far off when the only wild animals to be seen will be in the national parks or in zoological gardens and other local parks. At the present time the Mount McKinley region, with its abundance of animals, large and small, is a park only in name, and might just as well have never been created so far as it is a useful game-conserving agency. It is to be hoped that the Congress will, in its next session, see its way clear to appropriate at least \$10,000 for the park, in order that a fair measure of protection may be given to the big preserve.

CLAIM THAT MOUNTAIN IS SINKING.

Prof. Herschel Parker, who climbed almost to the summit of Mount McKinley, recently stated that earthquakes in the north during the past few years have caused the mountain to drop 500 feet in altitude. This statement has not been confirmed by other scientists.

CAPULIN MOUNTAIN NATIONAL MONUMENT, N. MEX.

This area, containing 680.37 acres, was set apart as a national monument on August 9, 1916, as a striking example of recent extinct volcanoes and of great scientific and geologic interest. It is located in Union County, N. Mex. Mrs. William H. Jack, the able custodian, reported that late snows and early rains made the neighborhood very attractive to visitors, who come in increasing numbers. Many take the climb to the top of the crater for the fine view over the surrounding country. August and September were the record months for visitors, but throughout the year it is estimated that about 600 autos, averaging five persons each, stopped at the monument. It is popular as a picnicking ground for the surrounding towns and villages.

Roads to the monument are in good condition, though several branch roads on the reservation itself are in bad shape.

A survey of the monument area is being made to serve as a basis for future needs.

CASA GRANDE NATIONAL MONUMENT, ARIZ.

This monument, one of the most popular from a tourist standpoint, was set aside because of the great scientific value of its ruins. These relics of a prehistoric age and people were first discovered in 1694, even then in ruinous condition. The area involved is only 480 acres, reserved since March 2, 1889, and formerly considered a national park. By presidential proclamation of August 3, 1918, it was accorded national monument status.

Frank Pinkley, of Florence, Ariz., is the custodian. He has marked his incumbency with a whole-hearted enthusiasm and efficiency in achievement that evidences his intense interest in the prehistoric ruin monuments of the Southwest. He also acts as custodian of the Tumacacori Mission, and has supervised occasional improvements on other neighboring monuments. His reports, on pages 319, 322, 330, are well worth reading.

The monument area was kept clear from brush and the picnicking grounds for visiting motorists and parking spaces for the motors kept in good condition. The gain in visitors to this monument, however, is particularly noteworthy. The total figures for the travel year,

October 1, 1919, to September 30, 1920, amounted to 3,282 automobiles with 7,720 persons, as compared with 1,714 automobiles and 3,677 visitors for last year. These figures are a concrete showing of the popularity of the area, and the drawing power of our historic national monuments when opened to the public under proper custody.

CHACO CANYON NATIONAL MONUMENT, N. MEX.

Archæological and other scientific societies have given this interesting monument particular attention in the past. The remarkable cliff-dwelling ruins covered in the 20,625 acres forming this monument offer unusual opportunities for excavation and other research work; these, in fact, were the causes for its establishment as a national monument on March 11, 1907. The excavation of a number of the ruins in preceding years was accomplished under permit granted to the American Museum of Natural History, of New York City, which centered its activities on the Pueblo Bonito site. This large ruin contained originally about 1,200 rooms.

During the year a permit was granted to the American School of Research, of Santa Fe, to conduct explorations in the Chetro Kettle ruin, one of the largest prehistoric ruins discovered on the area. The National Geographic Society also was granted a permit to conduct a reconnaissance survey of the entire area with the view of formulating plans for its possible exploration on a large scale; Mr. Neil Judd, of the Smithsonian Institution, is conducting this reconnaissance. The service is cooperating in every way possible with the Smithsonian Institution in facilitating the progress of this exceedingly important historic and scientific research work.

COLORADO NATIONAL MONUMENT, COLO.

This area of 13,883 acres is one of great beauty and interest because of its remarkable exhibits of erosion forms. It was created a national monument on May 24, 1911. The resurvey of the townships in this section, which the General Land Office has completed, shows that certain boundary adjustments will be necessary and that some additional territory would be desirable. There are, however, some perplexing problems of land holdings involved, and the procedure as to the acquisition of these must be definitely solved before steps can be taken to enlarge it.

DEVILS TOWER NATIONAL MONUMENT, WYO.

Through the enthusiastic cooperation and the high public spirit of Nils Nilson, county surveyor of Cooks County, Wyo., the service has been able to undertake the construction of a road leading directly to the base of the Devils Tower itself, a remarkable natural tower of volcanic origin, about 1,200 feet in height, forming the chief attraction of the monument. Work on this road, because of the smallness of our monument appropriation, had to be extended over a period of several years and has not yet been fully completed. The monument is receiving an increasing number of visitors who like to camp on the ground. There is a good spring available and the climate is particularly alluring. A small log shelter cabin, near the

foot of the tower on the picnic grounds, should be constructed to give temporary shelter at least to these visitors.

The monument was created by presidential proclamation September 24, 1906.

DINOSAUR NATIONAL MONUMENT, UTAH.

As the name indicates, this monument was set aside because of its extraordinary deposits of fossil remains of prehistoric animal life. The date of its establishment was October 4, 1915. For a number of years the Carnegie Institute, of Pittsburgh, Pa., under permit from the park service, has quarried large quantities of gigantic fossils and are still continuing this work into stratas that promise great scientific results. The institute has already expended over \$100,000 in developing the quarry. While the work is becoming increasingly difficult and expensive, it proposes to carry it forward until, from a scientific standpoint, it is thoroughly completed. The monument has no custodian.

EL MORRO NATIONAL MONUMENT, N. MEX.

El Morro, containing the historic inscription rock, is becoming increasingly popular with the tourist to the southwest. The many inscriptions carved on this rock by the early Spanish pioneers have given it the name, Inscription Rock. The region is rich in history of the most colorful kind, since the location of the rock on the main trail between the new and old Mexicos, with water, firewood, and shelter easily available, made it a favorite halting place for the adventurous sixteenth and seventeenth century travel.

As these inscriptions are the most precious exhibits of the monument, the service is concerned over their protection. How to prevent vandals chipping out sections of the inscriptions or chiseling their names on the walls is receiving our earnest consideration. It is impracticable to employ a resident custodian. How to protect the inscriptions from the wear and tear of the elements is another problem. The Egyptian obelisk in New York City is protected from freezing and thawing by covering it with a transparent substance, and this has apparently served well to protect the hieroglyphics on the obelisk. In order to help solve this very interesting problem the United States Bureau of Standards has been furnished with 2 or 3 cubic feet of the rock, on which experiments are being conducted, and the service hopes before the year is over to have some definite scheme adopted for the complete protection of these tremendously interesting inscriptions. There are old ruins at the top of the rock, and our estimate for marking the trail to the top has been included in next year's budget.

The year has seen a remarkable increase in travel to the monument, due undoubtedly to the improvement of the roads in western New Mexico. A great deal of the traffic comes from Gallup, N. Mex., about 50 miles distant, on the Santa Fe, where excellent accommodations are offered the tourist, but the Grants Inscription Rock road is being used by some transcontinental motorists.

The monument was created by presidential proclamation December 8, 1906.

GRAN QUIVIRA NATIONAL MONUMENT, N. MEX.

Gran Quivira, one of the most important ruins of early Spanish mission churches in this country, and for that reason created a monument on November 1, 1909, was enlarged from 160 to 560 acres during the year by a second presidential proclamation. This was done to take in other important ruins, mostly Pueblo. Considerable excavation work has been done in the past by the School of American Research, of Santa Fe, under permit from the park service. This school owns very important ruins on adjoining tracts, and it was to protect these as well as the Federal holdings that these tracts were included in the enlargement.

There are many rumors locally that the monument contains hidden treasure, and many requests for permission to dig are declined.

KATMAI NATIONAL MONUMENT, ALASKA.

With an area of over a million acres, and manifold beautiful and awe-inspiring volcanic phenomena, Katmai is far the largest and most spectacular member of the monument system. After being discovered and made known by the National Geographic Society, it was established by presidential proclamation September 24, 1918. The monument is located near the base of the Alaska peninsula, opposite Kodiak Island, and takes its name from Mount Katmai, whose great eruption in June, 1912, is one of the greatest on record. The National Geographic Society has sent five expeditions into the areas under the direction of Dr. Robert F. Griggs, and all the information about it comes from their reports.

Among the remarkable natural phenomena is the Valley of Ten Thousand Smokes, discovered in 1916 and explored the following three years. This is a smooth-floored valley, 9 miles in greatest width, surrounded by high mountains. For over 15 miles down this valley the ground is all broken open and gives vent to several millions of fumaroles (little volcanoes). These are surrounded by deposits of all colors of the rainbow, and present a spectacle altogether without parallel elsewhere. Some of them are so hot as to melt lead and zinc, or burn wood with ease, but yet they may be approached closely without danger, for all violent activity has subsided.

Even more magnificent a spectacle is the crater of Katmai, the largest active crater in the world. It is roughly circular, 3 miles in greatest diameter, and 3,700 feet in depth. At the bottom is a wonderful turquoise lake of hot water more than a mile in diameter and of unknown depth.

A topographic map, covering the monument and the country immediately adjacent, is in course of preparation in cooperation with the United States Geological Survey. Over 500 square miles in the central part of the monument has already been completed in preliminary form, and all field work done, and skeleton maps with control points located and numbered, together with panoramic photographs upon which the stations and points are located, have been turned over to the Geological Survey.

In addition to the volcanic phenomena the region round about contains some magnificent lake and mountain scenery. Water fowl—ducks, geese, and swans—and fish are abundant, as are also the gi-

gantic Alaskan brown bears, the largest of carnivorous animals. All of which presages a future that will make the Katmai National Monument one of the most popular of our great scenic reservations.

At present it is comparatively inaccessible, but one of the contributions of the last expedition was the discovery of Geographic Harbor, a previously uncharted bay, which affords a fine entrance to the region, suitable for the use of the largest of the excursion steamers that ply the Alaskan waters. All that is needed to make the region readily accessible to the public is an automobile road about 30 miles in length.

LEWIS AND CLARK CAVERN NATIONAL MONUMENT, MONT.

This monument contains an immense limestone cavern, located near Yellowstone National Park, and because of its great scientific interest was created a national monument on May 11, 1908. It was enlarged on May 16, 1911. Due to our inability to secure a custodian, and because of its proximity to Yellowstone Park, it has been temporarily placed under the general supervision of the superintendent of that park. Because of its comparative present inaccessibility and due to depredations by visiting tourists the cavern was closed, but, unfortunately, entrances can be forced with ease and there is no adequate protection at present. The business men of Butte and other Montana cities feel a keen interest in the preservation of this cavern, in the development of easier methods of approach, and the question of a resident custodian. With the development of the Part-to-Park Highway and its feeders rare scenic exhibits such as this will accent motoring trips.

MONTEZUMA CASTLE NATIONAL MONUMENT, ARIZ.

The Montezuma Castle National Monument embraces 160 acres of land in the northeastern part of Yavapai County, Ariz. It was created a national monument by presidential proclamation, dated December 8, 1906, its chief element of interest being a castle of true cliff-dwelling type, built entirely in and considerably above a cliff of tufa or volcanic ash composed of several strata of material laid horizontally and of varying degrees of hardness. The cliff has by erosion produced more or less deep recesses or hollows within the cliff, the largest of which is occupied by the Montezuma Castle. This apparently was a communal living house. Many of the smaller recesses were walled up and used for storage places or single-family dwelling houses. The castle represents the highest skill of the builders of that locality and time, and undoubtedly took by far the greatest amount of labor to build. It shows at least three stages of building.

For a long time a custodian has been considered necessary, particularly to prevent acts of vandalism, and it is hoped before another year has gone by that arrangements can have been made to secure a custodian from among the interested neighborhood people. In September, 1919, Custodian Pinkley, of the Casa Grande National Monument, inspected the monument and reported the need of considerable trail and protective work, and during the season we were able to make a small allotment to accomplish the most necessary

temporary improvements. The trails should be cleared out and built so that visitors may get from an interesting camp ground, about a half a mile away, to the castle with safety and comfort. But perhaps the most important need is the construction of a trail from the castle up to the mesa over the cliff, so that visitors may be able to get to the castle during times of high water in a creek which, at such times, overflows the lower trails. The monument holds the interest of the visitor to a rare degree, and undoubtedly it will play its important, if modest part, in the development of that section of the country.

MUIR WOODS NATIONAL MONUMENT, CALIF.

Situated close to San Francisco, the Muir Woods annually draws throngs of admiring visitors. The entire area of 295 acres was donated to the Government by Mr. William Kent to preserve the stands of *Sequoia sempervirens* on the tract. It was created a monument on January 9, 1908.

Mr. Kent arranged during the past season to present several additional adjoining tracts of beautiful forest lands to the Government, the transfer papers now being in course of preparation, and it is his intention to convey a particularly beautiful wooded gorge called Steep Ravine as soon as adjustments of certain features connected with the use of the water in the ravine can be effected.

The area was carefully patrolled by the custodian and kept in good condition. The popularity of picnicking makes it a difficult matter to keep the monument area looking neat and attractive, but this was accomplished. Three small log buildings for the convenience of the public were built, trails kept clean and free from brush, and all bridges, etc., kept in a good state of repair.

A small cottage on the monument for the custodian, Mr. Andrew Lind, is an urgent necessity, the present small cabin on private lands outside the monument being hardly habitable.

NATURAL BRIDGES NATIONAL MONUMENT AND RAINBOW BRIDGE NATIONAL MONUMENT, UTAH.

The natural bridges in the monument of that name are among the largest of their kind. The largest bridge is 222 feet high, 65 feet thick at the top of the arch, the arch being 28 feet wide. The span itself is 261 feet, with a height of 157 feet. The other two are slightly smaller. They were covered into the monument system April 16, 1908, September 25, 1909, and February 11, 1916.

The Rainbow Bridge has a height of 309 feet above water and a span of 278 feet. Its proportions are very symmetrical and shaped like a rainbow; it is from this feature that it gets its name. It was covered into the monument system May 30, 1910.

Due to the comparative inaccessibility of these monuments, only a few people have visited them, but with the opening up of roads in that section of Utah I predict that thousands of tourists will be attracted there. They are among the most unusual of our great natural exhibits and are bound to create a great deal of interest.

An interesting narrative as to how the bridges of the Natural Bridges National Monument got their names and also a relation of the discovery of the Great Rainbow Bridge, both by William Boone Douglas, cadastral engineer of the United States General Land Office, is given on pages 327, 328 of this report.

NAVAJO NATIONAL MONUMENT, ARIZ.

In my last year's report I elaborated to some extent upon the great possibilities in restoring the prehistoric ruins and cliff dwellings comprising the Navajo National Monument. In the preceding season Mr. Neil Judd, of the Smithsonian Institution, spent considerable time in a survey of the exhibits in this area, and called attention to the restoration of many of the important ruins because the ravages of time and the elements were playing havoc with their condition. Keet Seel, a ruin said to be surpassed in size only by the Cliff Palace of the Mesa Verde Park, is urgently in need of repair. Unfortunately, I was not able to secure a larger appropriation from Congress for the administration of our national monuments, and this work had to be deferred, as did many other important monument projects. The monument was established March 20, 1909, and reduced in area March 14, 1912.

PAPAGO SAGUARO NATIONAL MONUMENT, ARIZ.

Located on the road between Phoenix and Tempe is the Papago Saguaro National Monument, created by presidential proclamation of January 31, 1914, primarily to preserve the splendid collection of characteristic desert flora. Numerous pictographs and interesting rock formations are found on the more than 2,000 acres of desert land. It was not until October 8, 1919, that we were able to appoint a custodian. Mr. J. E. McClain of Tempe, Ariz., accepted the appointment at a nominal salary. Aside from its scientific interest, the monument is a favorite picnic grounds with local residents.

An interesting publication, entitled "The Birds of the Papago Saguaro National Monument," will soon be issued by the National Park Service. It was compiled by Mr. Harry S. Swarth, of the University of California. Its publication is eagerly wanted by some of the scientific and educational institutions.

PETRIFIED FOREST NATIONAL MONUMENT, ARIZ.

Probably none of our national monuments has received greater publicity or been accepted with greater alacrity as a great scenic feature deserving of the attention of the tourist than the Petrified Forest National Monument in Arizona, situated near both a transcontinental railroad and good automobile highways. A large number of visitors spend many profitable hours in the inspection of the many natural curiosities offered by this monument. Set aside as a national monument in 1906, it was reduced to its present area of 25,625 acres in 1911. It is located in Apache and Navajo Counties of Arizona. The ground is covered with fossilized wood, some of which has assumed the most brilliant colors, while some of it, instead of coloring, exhibits a remarkably well-preserved grain.

These trees belong to a now extinct specie of cone-bearing trees (*Araucarioxylon arizonicum knowltoni*), were carried by water to their present resting place, and embedded in sedimentary layers that solidified to stratified marls and cross-bedded conglomerate sandstone. In this bed, under superimposed layers of more or less solid sandstone, marls, and slate, these in turn covered by an inland sea, the decaying organic matter of the logs was slowly replaced by minute particles of silica deposited out of presumably alkaline solution, the admixture of certain minerals causing the resulting "stone tree" to assume colors beyond description.

The subsequent upheavals and erosion have brought about the exposure of these logs, which now to a great extent are reduced to sections and fragments. Few logs remain actually in place (a notable example is the Natural Bridge, a petrified log spanning a canyon 45 feet wide); the majority have been undermined by erosion, broken into sections generally 3 to 5 feet long, some of which in turn, through surface expansion and contraction, have been reduced to fragments that pave the ground with a profusion of agate, chalcedony, jasper, and carnelian.

Roads within the monument were improved through an allotment by the service for that purpose, but funds are urgently needed to put in thoroughly satisfactory roads. The monument is generally accessible during the entire year, with the exception of such times when high water or quicksand in the Rio Puerco renders the stream impassable. It is for this reason that a bridge across this river near Adamana is urgently needed to make the forest accessible at all times. It would also permit of better protection for the monument by patrolling rangers to prohibit vandalism; many hundreds of pounds of stone annually are taken away unauthorizedly.

From Adamana, a station on the Santa Fe, auto stages make daily trips to the most attractive and interesting parts of the forest. There is also a small but excellent hotel at that point. The monument can, however, also be reached by stage from Holbrook. Road and trail signs for the purpose of directing visitors about the forest are badly needed.

PINNACLES NATIONAL MONUMENT, CALIF.

This interesting monument was created by presidential proclamation on January 16, 1908. Its many spiral-like rock formations, from 600 of 1,000 feet high, are visible for many miles and give the monument its name. No money was spent on the monument during the year.

An unfortunate situation exists in this monument. Recent purchasers of an alienated tract of land within the monument which is traversed by the sole road have fenced off access to the monument and are charging a toll for passage over their land. It is not possible to say at this time what the remedy is, but during the next year I hope to investigate the situation fully in order to make the monument accessible without charge to all who care to see it.

SCOTTS BLUFF NATIONAL MONUMENT, NEBR.

Sotts Bluff is the next to the youngest of our national monument group, being created on December 12, 1919. The bluff itself, the

principal feature of this reservation, was an important landmark for traders and pioneers in the early days of the nineteenth century. The chief reason for its receiving monument status was, however, not the scenic character of the high bluffs and hills of the area and vicinity, but the fact that many famous old historic trails, including the Oregon and Overland Trails, passed over this monument. On page 80 I have elaborated on the reasons for its creation.

Mr. Will Maupin, of Gering, Nebr., was appointed custodian of the monument and assumed charge on April 10, 1920. The area is popular for its picnicing advantages, and the efforts of the custodian during the year were principally directed toward keeping the monument grounds as sightly as possible.

SHOSHONE CAVERN NATIONAL MONUMENT, WYO.

The construction of a trail to the cavern during the preceding year enabled many sightseers to visit the cave and to view from points of vantage the beautiful surrounding country. Most of these visitors were bound to or from Yellowstone Park over the Cody Road. With the expenditure of but little funds this monument could be made an interesting stopping point for all motorists to the park. As soon as additional funds are supplied by Congress further improvements should be made on the trail and in the immediate vicinity of the cavern. It was established as a national monument on September 21, 1919.

SITKA NATIONAL MONUMENT, ALASKA.

Improvements during the year in this extremely interesting monument, situated about 1 mile from Sitka, Alaska, cover mainly the painting of some of the totem poles which form the most unique exhibit on the monument. Due to the construction of these poles and the action of the elements, it is necessary to keep them well painted, and for a number of years Mr. E. W. Merrill, of Sitka, has attended to this work for the park service. Six colors are used and usually two coats of paint.

Occasional cleaning up of the grounds to keep the area in presentable condition was attended to, but not much more could be accomplished from the small funds available for that monument. One of the urgent improvements is the repair of the small cable suspension bridge over the Indian River leading to the monument, and in anticipation of a heavy travel of tourists this work should be undertaken at the earliest possible moment. Apparently this monument is to become one of the most attractive points of interest on a trip to our Alaskan possessions.

TUMACACORI NATIONAL MONUMENT, ARIZ.

The Franciscan mission San Jose de Tumacacori, founded by Father Kino about 1730, and one of a chain of Spanish missions established throughout Arizona, forms the historic attraction of this monument. The monument was created September 15, 1908, and contains only 10 acres. For a number of years the title to this

area was in dispute, but when the decision on the claims of the United States was adverse, the public-spirited owners of the tract donated it to the Government. It is desirable that a clear right of way be obtained to the State highway; to this end 10 acres of public lands to the west have been temporarily withdrawn from entry by Executive order of July 26, 1920, pending determination as to the advisability of including these lands within the monument. This tract is separated from the present monument area by a 5-acre tract in private ownership; and if this tract can be obtained by donation or by gift from the interested communities, the monument will be enlarged. Frank Pinkley, custodian of the Casa Grande monument, has charge of the ruin.

Surrounding towns, including particularly Nogales and Tucson, have always manifested a great interest in the protection of the old mission, and through their cooperation its complete roofing is expected to be accomplished within the next few months. The service this year was able to allot \$800 toward this long-delayed, much-needed improvement, on the condition that the interested towns contribute the remainder of the amount needed; an offer to this effect had been made by them in preceding years when the service was not able to respond with an equal sum. The Nogales Chamber of Commerce has promised \$600 toward this work, and it is believed the remainder will not be difficult to raise.

The mission was kept in neat condition during the year. It is estimated that about 5,000 visitors inspected the mission during the season.

Among the improvements needed for the further protection of the mission is a fence to keep out trespassing cattle. They now use the ground around the mission as a bedding ground, which gives the monument an unsightly appearance and besides constitutes quite a nuisance to tourists.

On May 30 last the Young Men's Club, of Nogales, held an afternoon and evening meeting at the mission and were addressed by Prof. Byron Cummings, of the University of Arizona. More of these excursions should be undertaken to our historic monument ruins by educational institutions. The opportunities for such development work are boundless.

VERENDRYE NATIONAL MONUMENT, N. DAK.

On June 29, 1917, the President issued a proclamation reserving as the Verendrye National Monument certain lands in the vicinity of Sanish, N. Dak., formerly included in the Fort Berthold Indian Reservation. This was done because of the historic interest of the area, the chief feature of which is Crowhigh Rutte, a peculiar mountain formation from which the explorer, Verendrye, first beheld the territory beyond the Missouri River. Mr. W. T. Thompson, of Sanish, is the custodian. At the time of the creation of this monument, however, certain persons were making various uses of lands included therein without permit. During the year action was taken to oust these squatters from their temporary foothold. Legal proceedings were instituted through the Department of Justice to remove all unauthorized structures.

YUCCA HOUSE NATIONAL MONUMENT, COLO.

The Yucca House National Monument, containing ruins of great archaeological value and relic of the prehistoric inhabitants of that locality, is located close to the Mesa Verde National Park. The area is a gift to the Nation from Mr. Henry Van Kleeck, of Denver, Colo., and was given national monument status by proclamation of the President dated December 19, 1919. It is the youngest member of our national monument system. In connection with his excavation and restoration work at the Mesa Verde Park, Dr. Walter Fewkes, of the Smithsonian Institution, visited this monument during the year to inspect the condition of the ruins and make plans for their future safeguarding. The monument temporarily is administered in connection with the Mesa Verde National Park.

LEGISLATION.

Reference has already been made to legislation relating to the national parks which was enacted into law since the preparation of the last annual report, or which is now pending in Congress. The text of the new laws will be found in Appendix D of this report, together with important reports of committees of Congress relating to these laws or to pending measures.

The following is a brief summary of this legislation:

PARK BILLS ENACTED INTO LAW.

The general deficiency act of November 4, 1919,²¹ carried appropriations of \$25,000 for Yellowstone National Park and \$62,000 for Glacier National Park.

The act of November 19, 1919,²² entitled "An act to establish the Zion National Park in the State of Utah," gave the Zion National Monument the status of a national park. This was S. 425 of the Sixty-sixth Congress, which passed the Senate on June 20 and the House on October 6. It was referred to on page 131 of my annual report for 1919.

The act of February 27, 1920,²³ entitled "An act to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park," gave the governor of Hawaii authority to make certain exchanges of territorial lands for private holdings in the park. This measure was H. R. 3654, which passed the House on November 5, 1919, and the Senate on February 18, 1920. It was referred to on page 131 of my 1919 annual report.

The act of June 2, 1920,²⁴ entitled "An act to accept the cession by the State of California of exclusive jurisdiction of the lands embraced within the Yosemite National Park, the Sequoia National Park, and General Grant National Park, respectively, and for other purposes," was H. R. 12044, which passed the House on April 5 and the Senate on May 17. The act of the State ceding jurisdiction was printed on page 306 of my 1919 annual report.

²¹ Public No. 73, Sixty-sixth Congress.

²² Public No. 83, Sixty-sixth Congress.

²³ Public No. 150, Sixty-sixth Congress.

²⁴ Public No. 235, Sixty-sixth Congress.

The general deficiency act of March 6, 1920,²⁵ carried appropriations amounting to \$65,875.76 for the national parks.

The general deficiency act of June 5, 1920,²⁶ carried an appropriation of \$3,250 to cover, up to June 30, 1921, the salaries of the two commissioners to be appointed under the act ceding the jurisdiction of certain parks in California to the United States.

The sundry civil act of June 5, 1920,²⁷ carried an appropriation of \$973,820 for the National Park Service in Washington and for the administration, protection, maintenance, and improvement of the various national parks and monuments. It also reappropriated the unexpended balance of the appropriation and authorization contained in the sundry civil appropriation act for the fiscal year 1919 for the construction of the new administration and Government free bathhouse building. A provision was also included authorizing the Secretary of the Interior to accept patented lands, rights of way over patented lands, or other property within the various national parks and monuments, and moneys which may be donated for the national park and monument system.

On May 3, 1920, the House of Representatives agreed to H. Res. 159, directing the Secretary of the Interior to investigate and report to the House as to the suitability, location, cost, and advisability of securing a stand of redwoods for national park purposes.

On June 10, 1920,²⁸ the President signed the water-power act, which is referred to in another part of this report. It creates the Federal Water Power Commission, composed of the Secretaries of the Interior, War, and Agriculture, and gives this commission authority to issue power permits in national parks and monuments "only after a finding by the commission that the licenses will not interfere or be inconsistent with the purpose for which said reservation was created or acquired, and shall be subject to and contain such conditions as the Secretary of the department under whose supervision such reservation falls shall deem necessary for the adequate protection and utilization of such reservations." In section 3 the following definition is made:

"Reservations" means national monuments, national parks, national forests * * * and other lands and interest in lands owned by the United States and withdrawn, reserved, or withheld from appropriation and disposal under the public land laws; also lands and interests in land acquired and held for any public purpose.

Section 17 provides that 50 per cent of charges arising from licenses issued in national monuments and national parks shall be paid into the reclamation fund, and 37½ per cent shall be paid to the treasury of the State in which the parks and monuments affected lie. The remaining 12½ per cent is to be paid to the miscellaneous receipts of the Federal Treasury. As stated before, there is no question but what this act establishes a menace to all national parks and should be repealed in so far as it relates to the national parks and monuments. This act was H. R. 3184. It passed the House of Representatives July 1, 1919, and the Senate January 15, 1920.

* Public No. 155, Sixty-sixth Congress.

* Public No. 264, Sixty-sixth Congress.

* Public No. 246, Sixty-sixth Congress.

* Public No. 280, Sixty-sixth Congress.

PENDING NATIONAL-PARK LEGISLATION.

The following bills regarding the national parks are now pending in Congress:

S. 1391,²⁹ "A bill to add certain lands to Sequoia National Park and to change the name of said park to Roosevelt National Park," was introduced on June 5, 1919, by Senator Phelan. This measure, which was referred to in my 1919 annual report, is the same as S. 2021 of the Sixty-fifth Congress. This bill was reported out by the Public Lands Committee on February 25, 1920.

H. R. 5006,³⁰ identical with S. 1391, was introduced on June 5, 1919, by Mr. Elston. Hearings were held on this bill on February 24, 25, and 26, 1920, before the Committee on the Public Lands, and it was reported out on March 25, 1920.

H. R. 1412, "A bill to add certain lands to Yellowstone National Park," was introduced on May 21, 1919, by Mr. Mondell. This measure is identical with H. R. 13350 of the Sixty-fifth Congress, referred to in my last annual report. It proposes to add the Teton Mountains and other scenic territory to the Yellowstone.

S. 3895, "A bill authorizing the granting of certain irrigation easements in the Yellowstone National Park, and for other purposes," was introduced on February 10, 1920, by Senator Nugent, and was passed by the Senate April 6, 1920.

H. R. 12466,³¹ identical with S. 3895, was introduced by Mr. Smith of Idaho on February 11, 1920. It was reported to the House on March 25, 1920. The bill came up on the unanimous consent calendar on April 5 and again on April 19, but was objected to on both occasions. On April 20, 1920, House Resolution 527 was introduced, calling for the immediate consideration of H. R. 12466 upon the adoption of the resolution, the bill to be passed after one hour of debate. A hearing on this resolution was held by the Rules Committee on May 25. No action was taken on the resolution, and the bill is still on the calendar.

S. 3379, "A bill to establish the Utah National Park in the State of Utah," introduced by Senator Smoot on November 3, 1919, proposes to give the Bryce Canyon region a national-park status.

S. 2797³², "A bill to add certain lands to Crater Lake National Park," which was introduced by Senator McNary, of Oregon, on August 15, 1919, was passed by the Senate on April 5, 1920. This bill, which is identical with S. 4283 of the Sixty-fifth Congress, was referred to in my 1919 annual report.

S. 666, "A bill creating the National Park of the Cliff Cities," introduced by Senator Jones, of New Mexico, on May 23, 1919, proposes to make the Bandelier National Monument and adjacent territory a national park. This was referred to in my last report.

S. 2374, "A bill to establish the Pajarito National Park," introduced by Senator Jones, of New Mexico, was proposed as an alternative to S. 666.

H. R. 11773, "A bill making reservation and withdrawing from settlement, occupancy, or sale, and dedicating and setting apart as

²⁹ See committee report on p. 371.

³⁰ See committee report on p. 374.

³¹ See committee reports on pp. 379-386.

³² See committee report on p. 378.

a national monument a certain tract of land in the county of Riverside, State of California," proposes to preserve the Palm Canyon region.

Other pending measures provide for the creation of the Mammoth Cave National Park, Ky.; Mount Katahdin National Park, Me.; Mount Baker, Yakima, and Grand Coulee National Parks, in the State of Washington; the Mississippi Valley National Park, Iowa and Wisconsin; and the Killdeer National Park, N. Dak.

PRESIDENTIAL PROCLAMATIONS.

By proclamation ³³ the President, on November 25, 1919, enlarged the Gran Quivira National Monument, N. Mex., increasing the area from 160 to 560 acres.

By presidential proclamation of December 12, 1919,³⁴ the Scotts Bluff National Monument in the State of Nebraska was established.

By presidential proclamation of December 19, 1919,³⁵ the Yucca House National Monument in the State of Colorado was established.

Monument projects are also pending which include the towers and castles of the Hovenweep district near the Colorado-Utah boundary line and the Palm Canyon of California, which contains an unusual species of palm. As stated before, H. R. 11773, to make a monument of this latter area, is now pending in Congress.

EXECUTIVE ORDERS.

Executive orders affecting national parks and national monuments were issued as follows:

June 30, 1920,³⁶ a withdrawal of lands in South Dakota pending examination to determine whether they should be made a national monument to protect, in the public interest, the rich mesozoic deposits of cycads and other characteristic examples of paleobotany numerous found there.

July 14, 1920,³⁷ a withdrawal of lands in South Dakota to protect the water supply of Wind Cave National Park and the national bison range therein.

July 26, 1920,³⁸ a withdrawal of lands in Arizona pending determination as to advisability of including such lands within the Tumacacori National Monument.

CHANGES IN PERSONNEL.

On August 19, 1920, B. Leslie Vipond, an auditor in the Bureau of Internal Revenue of the Treasury Department, was appointed chief clerk of the National Park Service, to succeed F. W. Griffith, who left the service to assume the duties of the chief clerkship of the Federal Power Commission.

On March 8, 1920, effective immediately, the Secretary of the department designated Supt. H. M. Albright, of Yellowstone National Park, field assistant to the director.

■ No. 1545.
■ No. 1547.
■ No. 1549.

■ No. 3297.
■ No. 3308.
■ No. 3314.

Daniel R. Hull was appointed assistant landscape engineer in the National Park Service at Large on July 24, assuming his duties on August 1, 1920.

Victor A. Endersby was appointed assistant engineer in the National Park Service at Large on June 21, entering on duty July 1, 1920.

William H. Peters, assistant engineer in the Service at Large, was designated acting superintendent of Grand Canyon National Park by the Service on August 2, 1919, effective immediately.

Roger W. Toll, superintendent of Mount Rainier National Park, resigned his position effective at the close of October 15, 1920. To fill the vacancy thus created, the department on October 13, 1920, appointed William H. Peters as superintendent of the park, terminating his position as assistant engineer in the Service at Large, and relieving him of the duties of the position of acting superintendent of Grand Canyon National Park.

D. L. Reaburn, former superintendent of Mount Rainier National Park, was, on September 25, appointed superintendent of Grand Canyon National Park, assuming his duties on October 1, 1920.

On July 12, 1920, John R. White was appointed superintendent of Sequoia National Park and acting superintendent of General Grant National Park to fill the vacancy created by the resignation of Walter Fry, who, effective July 15, accepted the commissionership for the parks tendered by the Department of Justice.

Walter W. Payne, superintendent of Glacier National Park, resigned from his position effective at the close of June 30, 1920. To fill this vacancy temporarily, the department, on June 18, 1920, designated George E. Goodwin acting superintendent of the park, these duties to be in addition to those of his position as civil engineer in the Service at Large.

Will M. Maupin was appointed custodian of Scotts Bluff National Monument on April 5, 1920, which reservation was created by presidential proclamation of December 12, 1919, Mr. Maupin being the first incumbent of the position.

REQUIREMENTS OF THE NATIONAL PARK SYSTEM.

Having in mind the accomplishments of the past few years since the National Park Service was established, and anticipating some of the problems that are facing us for solution, I consider the most important requirements of the service now to be the following:

1. The enlargement of the Washington office force so as to meet the increased demands placed upon it by the great use made of its parks, with adequate salaries for the officials.

2. The establishment of a definite permanent personnel nucleus in every national park of major importance.

3. The establishment of a touring division in the service to meet the tremendous demand for information regarding the national parks and monuments, and to cooperate with railroads, touring associations, automobile associations, highway associations, and others in the development of the travel industry within the United States.

4. The enlargement of existing hotel, camp, and transportation facilities in the various parks satisfactorily to meet the tremendous

demands of travel caused by the popularity of these great scenic areas.

5. The amendment of the Federal water-power act so as to exclude the national parks and monuments from within the scope of its provisions.

6. The adoption by Congress of a definite comprehensive program for road construction within the national parks and monuments.

7. Cooperation with State and private organizations for the protection and saving of important still-remaining stands of timber along the scenic highways leading to our national parks.

8. An adequate appropriation for the protection of all and the development of the most important of our national monuments.

9. Securing from Congress initial appropriations for the development and protection of Mount McKinley and Hawaii National Parks.

10. The passage of legislation effecting the enlargement of the Yellowstone National Park by the addition of areas to the south covering the Teton Mountains, the headwaters of the Yellowstone River, and territory lying north of the Buffalo Fork of the Snake River.

11. The passage of legislation effecting the enlargement of the Sequoia National Park to include the spectacular high Sierra region adjoining to east and north, and the dedication of this enlarged area as the Roosevelt-Sequoia National Park in memory of former President Theodore Roosevelt.

12. The passage of legislation effecting the enlargement of Crater Lake National Park northward to permit of proper development and administration.

13. The passage of legislation to add the Mount Evans region west of Denver, Colo., to the Rocky Mountain National Park.

14. Securing the grant of exclusive jurisdiction from the several States affected over the Rocky Mountain, Mesa Verde, Grand Canyon, and Lafayette National Parks.

15. The establishment of adequate game preserves in areas adjacent to many of our national parks for the better protection of our wild life during the trying winter seasons, primarily the Yellowstone, Yosemite, Sequoia, Mount Rainier, Grand Canyon, and Zion National Parks.

TO CONCLUDE.

As I look back upon the season's accomplishments, I feel the greatest pride and satisfaction not only in the achievements of the National Park Service in all the ramifications of its activities but in the ready response and enthusiastic, whole-hearted cooperation of public organizations and individuals in solving many of the problems that arose. When the elk in the Yellowstone were in danger of almost complete extermination by the rigors of an unusually severe winter and accompanying famine, public-spirited men stepped forward with money to purchase the hay that our depleted funds could not buy. Donations also of money to purchase private holdings containing stands of big trees in the Sequoia and timber along roads leading to the park were readily forthcoming at critical moments. When the parks were in danger of usurpation by aggressive

commercialism, the friends of the parks in Congress and throughout the Nation, ever alert, joined hands to ward off this evil; under repeated assaults our national-park policy is more firmly established than ever. With but one exception all public operators have worked unceasingly to meet the trust imposed upon them to supply the needed conveniences for the comfort of the traveler. The tremendous travel to the parks and monuments, now exceeding the million mark, evidences the spontaneous enthusiastic response of our people to the beckoning of these areas. Never before has the maxim to "See America first" been grasped more firmly as a publicity slogan than during the past year. And all this in the face of great national unrest. Much, of course, remains to be done. But I conclude this report with the prediction that with the inspiration of the past season's accomplishments before us the glorious destiny of our national parks as the greatest play and recreation grounds on earth is firmly assured.

• Very respectfully,

STEPHEN T. MATHER,
Director.

The SECRETARY OF THE INTERIOR.

APPENDICES

APPENDIX A.

THE NATIONAL PARKS AND MONUMENTS.

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NATIONAL PARKS.
ADMINISTERED BY THE NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR.

[Number, 19; total area, 10,889 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Statute reference.	Area (square miles).	Area (acres).	Private lands (acres).	Visitors, 1920.	Special characteristics.
Hot Springs Reservation.	Middle Arkansas.....	Apr. 20, 1832	{ 14 Stat., 506..... 21 Stat., 283..... }	1½	911.03	None.	163,850	{ 146 hot springs possessing curative properties— Many hotels and boarding houses—20 bath- houses under public control.
Yellowstone.....	Wyoming, Montana, and Idaho.	Mar. 1, 1872	17 Stat., 32, 33.....	3,348	2,142,720	None.	79,777	{ More geysers than in all rest of world together— Bolling springs—Mud volcanoes—Petrified forests—Grand Canyon of the Yellowstone, remarkable for gorgeous coloring—Large lakes—Waterfalls—Vast wilderness inhab- ited by deer, elk, bison, moose, antelope, bear, mountain sheep, etc.—Greatest wild bird and animal preserve in world.
Sequoia (sé-kwó'á).....	Middle eastern California..	Sept. 25, 1890	26 Stat., 473, 650.	262	161,697	2,680	31,508	{ The Big Tree National Park—12,000 sequoia trees over 10 feet in diameter, some 25 to 36 feet in diameter—Towering mountain ranges—Startling precipices—Cave of con- siderable size—Fine trout fishing.
Yosemite (yó-sém'-i-á).....	do.....	Oct. 1, 1890	{ 26 Stat., 650..... 33 Stat., 702..... 34 Stat., 831..... }	1,125	719,622.4	10,000	68,906	{ Valley of world-famed beauty—Lofly cliffs— Romantic vistas—Waterfalls of extraordi- nary height—3 groves of big trees—Large areas of snowy peaks—Waterwheel Falls— Good trout fishing.
General Grant.....	do.....	do.....	26 Stat., 650.	4	2,536	180	19,661	{ Created to preserve the celebrated General Grant Tree, 33 feet in diameter—6 miles from Sequoia National Park.
Mount Rainier (rá-nér').....	West central Washington..	Mar. 2, 1899	30 Stat., 993.	324	207,360	18.2	56,401	{ Largest accessible single peak glacier system— 26 glaciers, some of large size—45 square miles of glacier, 50 to 500 feet thick—Wonderful subalpine wild-flower fields.
Crater Lake.....	Southern Oregon.....	May 22, 1902	32 Stat., 202.	249	169,360	2,458.11	20,135	{ Lake of extraordinary blue in crater of extinct volcano, no inlet, no outlet—Sides 1,000 feet high—Interesting lava formations—Fine fishing.
Wind Cave.....	South Dakota.....	Jan. 9, 1903	32 Stat., 765.	17	10,899.22	None.	27,022	{ Cavern having many miles of galleries and numerous chambers of considerable size containing many peculiar formations.
Platt.....	Southern Oklahoma.....	{ July 1, 1902 (A pr. 21, 1904	{ 32 Stat., 641, 655..... 33 Stat., 220..... 33 Stat., 323, 323, 2338.	1½	848.22	None.	188,000	{ Many sulphur and other springs possessing medicinal value.
Sullys Hill.....	North Dakota.....	A pr. 27, 1904		1½	780	None.	9,341	{ Small park with woods, streams, and a lake— Is an important wild-animal preserve.

Mesa Verde (mā'sa vēr'dā).	Southwestern Colorado.....	{June 29, 1906 {June 30, 1913 May 11, 1910	34 Stat., 818..... 38 Stat., 92, 83, 84..... 36 Stat., 354.....	77	48,966.4	993	2,890	Most notable and best preserved prehistoric cliff dwellings in United States, if not in the world.
Glacier (glā'sher).	Northwestern Montana.....			1,534	931,631	16,508.1	22,449	Rugged mountain region of unsurpassed Alpine character—250 glacier-fed lakes of romantic beauty—60 small glaciers—Precipices thousands of feet deep—Almost sensational scenery of marked individuality—Fine trout fishing.
Rocky Mountain.....	North middle Colorado.....	{Jan. 26, 1915 {Feb. 14, 1917 Aug. 1, 1916	38 Stat., 794..... 39 Stat., 916..... 39 Stat., 432.....	397½	254,327	20,993	240,966	Heart of the Rockies—Snowy range, peaks 11,000 to 14,250 feet altitude—Remarkable records of glacial period.
Hawaii (ha-wī'e).	Hawaiian Islands.....			118	75,295	41,000	(*)	3 separate areas: 1—Kilauea, continuously active for century, and Mauna Loa, altitude 13,675 (largest active volcano in world, erupting every decade)—are on Hawaii; Haleakala, on Maui, 10,000 feet high, with tremendous rift in summit 8 miles across and 3,000 feet deep; contains many cones, gorgeous tropical forests, mahogany groves, and lava caves; erupted 200 years ago.
Lassen Volcanic (las'ven).	Northern California.....	Aug. 9, 1910	39 Stat., 442.....	124	79,561.53	2,955	2,000	Only active volcano in United States proper—Lassen Peak, 10,485 feet in altitude—Cinder Cone, 6,879 feet—Hot springs—Mud geysers—Ice caves—Majestic canyons—Numerous lakes—Fine forests.
Mount McKinley.....	South central Alaska.....	Feb. 26, 1917	39 Stat., 938.....	2,200	1,498,000	None.	(*)	Highest mountain in North America (altitude 20,300 feet)—Rises higher above surrounding country than any other mountain in world.
Grand Canyon &.....	North central Arizona.....	{Jan. 11, 1908 {Feb. 26, 1919 July 3, 1916	35 Stat., 2175..... 40 Stat., 1175..... 39 Stat., 1785.....	958	613,120	(*) 732.16	67,315	The greatest example of erosion and the most sublime spectacle in the world.
Lafayette &.....	Maine coast.....	{Feb. 26, 1919 {July 31, 1909 Mar. 18, 1918	40 Stat., 1178..... 36 Stat., 2468..... 40 Stat., 1760.....	8	5,000	None.	166,500	The group of granite mountains upon Mount Desert Island.
Zion &.....	Southwestern Utah.....	{Nov. 19, 1919	41 Stat., 356.....	120	76,800	9,817.72	3,692	Magnificent gorge (Zion Canyon), depth from 800 to 2,000 feet, with precipitous walls.—Great beauty and scenic interest.

1 In Wyoming, 3,114 square miles; in Montana, 193 square miles; in Idaho, 36 square miles.
 * Estimated.
 * No record kept.

* Formerly Grand Canyon National Monument.
 * Formerly Sierr de Monts National Monument; donated to the United States.

* Formerly Zion National Monument
 * Formerly Zion National Monument

THE NATIONAL MILITARY AND OTHER PARKS. ADMINISTERED BY THE WAR DEPARTMENT.

[Number, 7; total area, 22 square miles; chronologically in order of creation.]

Name.	Location.	When established.	Statute reference.	Area (acres).	Special characteristics.
Chickamauga and Chattanooga.....	Georgia and Tennessee.....	Aug. 19, 1860	26 Stat., 333, 978.	6,543	Beautiful natural park—Embraces battle fields of Chickamauga and Missionary Ridge, and scenes of other conflicts of the Civil War fought in the vicinity of Chattanooga during 1863.
Antietam Battle Field.....	Maryland.....	Aug. 30, 1860	26 Stat., 401	50	Scene of one of the greatest battles of the Civil War.
Shiloh.....	Tennessee.....	Dec. 27, 1864	28 Stat., 597.	3,546	Natural park embracing the battle field of Shiloh near Pittsburg Landing.
Gettysburg ¹	Pennsylvania.....	Feb. 11, 1865	28 Stat., 651	2,451	Beautiful natural park—Scene of Civil War combat—Probably better marked than any other battle field in the world.
Vicksburg.....	Mississippi.....	Feb. 21, 1869	30 Stat., 841	1,323	Beautiful natural park—Scene of the siege and surrender of Vicksburg in 1863 during the Civil War.
Lincoln's Birthplace ¹	Kentucky.....	July 17, 1916	39 Stat., 385	.....	Contains the log cabin and part of the farm where Abraham Lincoln was born.
Gullford Courthouse.....	North Carolina.....	Mar. 2, 1917	39 Stat., 996	125	Near Greensboro—Scene of one of the great battles of the Revolution; fought in 1781.

¹ Donated in whole or in part to the United States.

THE NATIONAL MONUMENTS.

ADMINISTERED BY THE NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR.

[Number, 24; total area, 1,815 square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Devils Tower.....	Wyoming.....	Sept. 24, 1906	34 Stat., 3236	1,152	Remarkable natural rock tower of volcanic origin, 1,200 feet in height.
Monterey Castle.....	California.....	Dec. 8, 1906	31 Stat., 3263	1,160	Pretentious cliff dwelling ruins of unknown age situated in a niche in face of a vertical cliff. Of scenic and historic interest.
El Morro.....	New Mexico.....	Dec. 8, 1906	34 Stat., 3264	160	Enormous sandstone rock carved in form of a castle, upon which inscriptions have been placed by early Spanish explorers. Contains cliff-dweller ruins.
Petrified Forest.....	Arizona.....	June 18, 1917	40 Stat., 1673	240	Of great historic, scenic, and ethnologic interest.
Chaco Canyon (old).....	New Mexico.....	Dec. 8, 1906	34 Stat., 3266	25,625	A abundance of petrified cactus trees, one of which forms a small natural bridge.
		July 31, 1916	39 Stat., 2119	.....	Number of cliff dwellers, including communal houses, in good condition and but little excavated.
		Mar. 11, 1907	36 Stat., 2119	1,200,000	

Muir Woods* (mūr).	Jan. 9, 1908	35 Stat., 2174	295	One of the most noted redwood groves in California, and was donated by Hon. William Kent, ex-Member of Congress. Located 7 miles from San Francisco.
Pinnacles.....	Jan. 16, 1908	35 Stat., 2177	2,080	Many spirelike rock formations, 600 to 1,000 feet high, visible many miles; also numerous caves and other formations.
Natural Bridges.....	Apr. 16, 1908	35 Stat., 2183	120	3 natural bridges, among largest examples of their kind. Largest bridge is 223 feet high, 65 feet thick at top of arch; arch is 28 feet wide; span, 261 feet; height of span, 157 feet. Other two slightly smaller.
Lewis and Clark Cavern*	Sept. 25, 1909	36 Stat., 2502	1,270	Immense limestone cavern of great scientific interest, magnificently decorated with stalactite formations. Now closed to public because of depredations by vandals.
.....	Feb. 11, 1916	39 Stat., 1764	1,270	
Montana.....	May 11, 1908	35 Stat., 2187	160	
.....	May 16, 1911	37 Stat., 1679	160	
Arizona.....	Sept. 15, 1908	35 Stat., 2205	10	Ruin of Franciscan mission dating from seventeenth century. Being restored by National Park Service as rapidly as funds permit.
.....	Mar. 20, 1909	36 Stat., 2491	1,600	Numerous pueblo, or cliff-dweller ruins, in good preservation.
Navajo (ná'v'á-hó).....	Mar. 14, 1912	37 Stat., 1733	360	Cavern of considerable extent, near Cody.
Shoshone Cavern (shó-shó'né).....	Sept. 21, 1909	36 Stat., 2501	210	One of the most important of earliest Spanish mission ruins in the Southwest.
Gran Quivira (grán ká-vé'rá).....	Nov. 1, 1909	36 Stat., 2503	1,560	Monument also contains pueblo ruins.
.....	Nov. 25, 1919	41 Stat., Proc., 1546		
Sitka.....	Mar. 23, 1910	36 Stat., 2601	157	Park of great natural beauty, and historic interest as scene of massacre of Russians by Indians. Contains 16 totem poles of best native workmanship.
Rainbow Bridge.....	May 30, 1910	36 Stat., 2703	160	Unique natural bridge of great scientific interest and symmetry. Height 309 feet above water, and span is 278 feet, in shape of rainbow.
Colorado.....	May 24, 1911	37 Stat., 1681	13,883	Many lofty monoliths, and is wonderful example of erosion, and of great scenic beauty and interest.
Papago Saguaro (pá'pá-gó sá-gwá'ró).....	Jan. 31, 1914	38 Stat., 1991	2,050	Splendid collection of characteristic desert flora and numerous pictographs. Interesting rock formations.
Dinosaur (dí'nó-sór).....	Oct. 4, 1915	39 Stat., 1752	80	Deposits of fossil remains of prehistoric animal life of great scientific interest.
Capulin Mountain (ká-pú'lín).....	Aug. 9, 1916	37 Stat., 1792	681	Cinder cone of geologically recent formation.
Varendrye (vé-rón-dré).....	June 26, 1917	40 Stat., 1677	253.04	Includes Crowhigh Butte, peculiar mountain formation, from which Explorer Varendrye first beheld territory beyond Missouri River.
.....	Mar. 2, 1909	25 Stat., 961	480	These ruins are one of the most noteworthy relics of a prehistoric age and people within the limits of the United States. Discovered in ruinous condition in 1694.
Casa Grande (ká sá grán dá).....	Dec. 10, 1909	36 Stat., 2504		Wonderland of great scientific interest in the study of volcanism. Phenomena exist upon a scale of great magnitude. Includes "Valley of Ten Thousand Smokes."
Katmai (ká'tá'mí).....	Aug. 3, 1918	40 Stat., 1818	11,098,000	Region of historic and scientific interest. Many famous old trails traversed by the early pioneers in the winning of the West passed over and through this monument.
Scotts Bluff.....	Sept. 24, 1918	40 Stat., 1855		Located on eastern slope of Sleeping Ute Mountain. Ruins of great archaeological value, relic of prehistoric inhabitants.
Yucca House* (yú'cá).....	Dec. 12, 1919	41 Stat., Proc., 1547	2,053.83	
.....	Dec. 19, 1919	41 Stat., Proc., 1548	9.6	

* Estimated.

* Donated to the United States.

* From Mar. 2, 1890, until Aug. 3, 1918, classified as a National Park.

THE NATIONAL MONUMENTS.
ADMINISTERED BY THE DEPARTMENT OF AGRICULTURE
 [Number, 10; total area, 5994 square miles; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Gila Cliff Dwellings (38718).....	New Mexico.....	Nov. 16, 1907.....	35 Stat., 2162.....	160.....	Numerous cliff-dweller ruins of much interest and in good preservation.
Tonto.....	Arizona.....	Dec. 19, 1907.....	35 Stat., 2168.....	1,640.....	Do.
Jewel Cave.....	South Dakota.....	Feb. 7, 1908.....	35 Stat., 2180.....	11,260.....	Limestone cavern of much beauty and considerable extent, limits of which are as yet unknown.
Wheeler.....	Colorado.....	Dec. 7, 1908.....	35 Stat., 2214.....	300.....	Of much interest from geological standpoint as example of eccentric erosion and extinct volcanic action. Of much scenic beauty.
Mount Olympus.....	Washington.....	Mar. 2, 1909.....	35 Stat., 2247.....	608,640.....	Contains many objects of great and unusual scientific interest, including many glaciers. Is summer range and breeding ground of the Olympic elk.
Oregon Caves.....	Oregon.....	Apr. 17, 1912.....	37 Stat., 1737.....	608,480.....	
		May 17, 1912.....	39 Stat., 1738.....	289,370.....	
Devil Postpile.....	California.....	July 12, 1909.....	36 Stat., 2467.....	480.....	Extensive caves in limestone formation of much beauty; magnitude not entirely estimated.
Walnut Canyon.....	Arizona.....	July 6, 1911.....	37 Stat., 1715.....	800.....	Spectacular set of hexagonal basaltic columns like an immense pile of posts.
Bandelier (Bán-dé-lyér).....	New Mexico.....	Nov. 30, 1915.....	39 Stat., 1781.....	980.....	Said to rank with famous Giant's Causeway in Ireland.
Old Kasaan (kă-săh).....	Alaska.....	Feb. 11, 1916.....	39 Stat., 1764.....	22,076.....	Contains cliff dwellings of much scientific and popular interest.
		Oct. 25, 1916.....	39 Stat., 1812.....	38.3.....	Vast number of cliff-dweller ruins, with artificial caves, stone sculpture, and other relics of prehistoric life.
					Abandoned Indian village in which there are numerous remarkable totem poles and other objects of historical interest.

¹ Estimated.

THE NATIONAL MONUMENTS.
ADMINISTERED BY THE WAR DEPARTMENT.
 [Number, 2; total area, 6 acres; chronologically in order of creation.]

Name.	Location.	Date of creation.	Statute reference of proclamation.	Area (acres).	Special characteristics.
Big Hole Battle Field ².....	Montana.....	June 23, 1910.....	.....	6.....	Site of battlefield on which battle was fought Aug. 9, 1877, between a small force of United States troops and a much larger force of Nez Percé Indians, resulting in rout for the Indians.
Cabrillo (kă-brī-lyó).....	California.....	Oct. 14, 1913.....	38 Stat., 1968.....	1.....	Of historic interest because of discovery of the territory now partly embraced in the State of California by Juan Rodríguez Cabrillo, who at this point first sighted land on Sept. 25, 1542.

¹ Estimated.

² Set aside by Executive order.

ORGANIZATION OF THE NATIONAL PARK SERVICE.

Stephen T. Mather, director.
Arno B. Cammerer, assistant director.
B. L. Vipond, chief clerk.
A. E. Demaray, editor.

FIELD SERVICE.**CIVIL ENGINEERING DIVISION.**

George E. Goodwin, civil engineer.
Victor A. Endersby, assistant engineer.

LANDSCAPE ENGINEERING DIVISION.

Charles P. Punchard, jr., landscape engineer.
Daniel R. Hull, assistant landscape engineer.

THE NATIONAL PARKS.

Crater Lake, Alex Sparrow, superintendent.
Glacier, George E. Goodwin, acting superintendent.
Grand Canyon, Dewitt L. Reaburn, superintendent.
Hot Springs, Dr. William P. Parks, superintendent.
Lafayette, George B. Dorr, superintendent.
Mesa Verde, Thomas Rickner, superintendent.
Mount Rainier, William H. Peters, superintendent.
Platt, Thomas Ferris, superintendent.
Rocky Mountain, L. C. Way, superintendent.
Sequoia, John R. White, superintendent.
General Grant, John R. White, acting superintendent.
Sullys Hill, Samuel A. M. Young, acting superintendent.
Wind Cave, Roy Brazell, superintendent.
Yellowstone, Horace M. Albright, superintendent.
Yosemite, W. B. Lewis, superintendent.
Zion, Walter Ruesch, acting superintendent.

THE NATIONAL MONUMENTS.

Capulin Mountain, Mrs. W. H. Jack, custodian.
Casa Grande, Frank Pinkley, custodian.
Colorado, John Otto, custodian.
El Morro, Evon Z. Vogt, custodian.
Muir Woods, Andrew Lind, custodian.
Navajo, John Wetherill, custodian.
Papago Saguaro, J. E. McClain, custodian.
Petrified Forest, William Nelson, custodian.
Tumacacori, Frank Pinkley, acting custodian.
Scotts Bluff, Will M. Maupin, custodian.
Verendrye, W. F. Thompson, custodian.

No superintendents or custodians have been appointed for the Hawaii, Lassen Volcanic, or Mount McKinley National Parks, or for the Chaco Canyon, Devils Tower, Dinosaur, Gran Quivira, Katmai, Lewis and Clark Cavern, Montezuma Castle, Natural Bridges, Pinnacles, Rainbow Bridge, Shoshone Cavern, or Yucca House National Monuments.

APPENDIX B.

REPORTS OF OFFICERS IN CHARGE OF THE NATIONAL PARKS AND MONUMENTS.

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HOT SPRINGS RESERVATION.

Dr. WM. P. PARKS, Superintendent, Hot Springs, Ark.

GENERAL STATEMENT.

In submitting my annual report for this fiscal year it is with much pleasure that I am able to report a decided increase in the business of the bathhouses as well as in the number of visitors to Hot Springs as compared with last year.

During the past fiscal year the total number of baths sold in the different pay bathhouses was 870,781 as compared with 729,997 last year, making a gain of 140,784 paid baths. The total receipts of these bathhouses this year were \$502,493.83 as compared with \$346,974.46 last year, showing a net gain of \$155,518.87. The net profits reported by these bathhouses this year were \$227,876.32, while the net profits last year were \$127,475.64, making an increase of \$100,200.68 as compared with the profits of last year. In addition to the total number of paid baths, 2,304 complimentary baths were given at the pay bathhouses, 100,669 baths were given at the Government free bathhouse, and 5,068 baths were given at the Leo N. Levi Memorial Hospital Bathhouse, a charitable institution, making a grand total of 978,772 baths given during the fiscal year, including paid baths, an increase of 154,446 over last year.

It is estimated that 162,850 persons visited Hot Springs during the present fiscal year. A large percentage of these visitors were persons of high standing in the business and financial world; many influential people in the affairs of the country. Hot Springs is becoming better known each year to the world for the benefits derived from bathing in its far-famed waters.

RADIOACTIVITY OF THE WATERS.

In 1904 the Secretary of the Interior authorized Dr. Bertram B. Boltwood, of Yale University, to report on the radioactivity of the waters. The following résumé of Dr. Boltwood's conclusions appeared in the annual report of the Secretary of the Interior for 1904:

"* * * The results of the electroscopic tests of the gases obtained by boiling the waters were very satisfactory, as they showed that the waters at Hot Springs are radioactive to a marked degree; and from other tests, taken to determine the properties of the emanations from the waters, it was found that the properties of these radioactive gases were identical with those of the radium emanation.

"On the other hand, when the water from which the gas had once been taken was boiled a second time, after being allowed to stand, no radioactivity was detected in the gas obtained from the second boiling, and it was therefore concluded that little or no radium salts existed in the waters. This conclusion was strengthened by the fact that a test of the residue of the waters which had been left by evaporation also failed to disclose any sign of radioactivity of this solid substance. A sample from the tufa deposit, formed by some of the springs on issuing from the ground, was also tested, and it was found that the amount of radium contained in 100 grams of tufa was less than one one-millionth of the quantity of radium associated with an equal weight of uranium of pitchblende. Samples of the gas which arose from the springs were also tested, and its radioactivity was found to be less than of an equal amount of gas by boiling the waters from the springs. The following conclusions are reached by Dr. Boltwood as the result of his investigations:

"1. The waters of the springs on the Hot Springs Reservation are all radioactive to a marked degree.

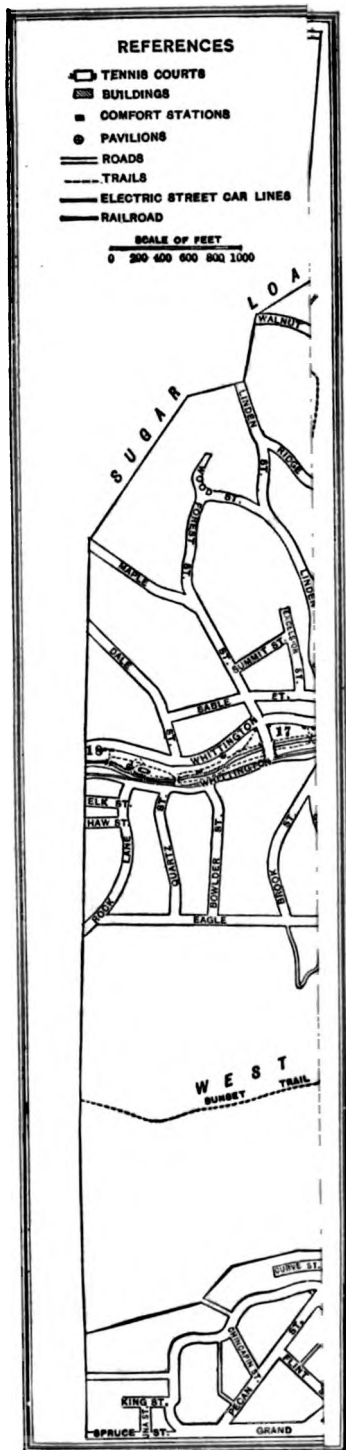
"2. The radioactivity of the waters is due to dissolved radium emanation (a gas) and not to the presence of salts of radium or other radioactive solids."

This report has, in a great measure, lifted the veil of mystery heretofore surrounding the healing agencies which have so long proved their efficacy in the restoration to health of suffering humanity.

RESERVATION.

Hot Springs Reservation, which contains 911.63 acres, consists of Hot Springs, North, West, and Sugar Loaf Mountains and Whittington Lake Park. The original reservation was established by act of Congress approved April 20, 1832, reserving four sections of land, including the hot springs. Disposition was made of portions of the land from time to time, and by act of Congress approved June 16, 1880, Hot Springs, North, West, and Sugar Loaf Mountains were forever reserved from sale and dedicated for public use as a park, having an area of 900.63 acres, to which was added, by authority vested in the Secretary of the Interior, what is known as Whittington Lake Park, containing 11 acres, making the total area of the permanent Hot Springs Reservation 911.63 acres.

By this act also the streets, courts, alleys, and other thoroughfares of the town of Hot Springs, Ark., as surveyed, opened, and established by the commission and not included in the permanent reservation, were ceded and dedicated to the corporation of the city of Hot Springs for public use.



LEGEND.
The numbers in this list refer to the numbers on the map:

1. Superintendent's office.
 2. Lamar bathhouse.
 3. Buckstaff baths.
 4. Ozark bathhouse.
 5. Magnesia bathhouse.
 6. Government free bathhouse.
 7. Fordyce bathhouse.
 8. Main entrance to reservation.
 9. Maurice bathhouse.
 10. Hale bathhouse.
 11. Superior bathhouse.
 12. Arlington Hotel and baths.
 12. Superintendent's residence (old).
 14. Rockafellow Hotel and baths.
 15. Majestic Hotel and baths.
 16. St. Joseph's Infirmary and baths.
 17. Whittington Lake Park.
 18. Keeper's residence.
 19. First Presbyterian Church.
 20. Catholic Church.
 21. Rector bathhouse and Waukesha Hotel.
 22. Milwaukee Hotel.
 23. Pullman Hotel.
 24. Arkansas National Bank.
 25. Masonic Temple.
 26. First Baptist Church.
 27. Leo N. Levi Memorial Hospital and bathhouse.
 28. Goddard Hotel.
 29. Alhambra bathhouse.
 30. Moody Hotel and baths.
 31. Court House.
 32. Como Hotel.
 33. Central Methodist Church.
 34. High School Building.
 35. Ozark Sanitorium bathhouse.
 36. Missouri-Pacific Depot.
 37. Rock Island Depot.
 38. City Hall and Auditorium Theatre.
 39. Business Men's League.
 40. Post Office.
 41. Great Northern Hotel.
 42. Citizens' National Bank.
 43. Marquette Hotel.
 44. Arkansas Trust Company.
 45. Security Bank.
 46. Eastman Hotel and baths.
 47. Elks' Club.
 48. Episcopal Church.
 49. Superintendent's residence (new).
 50. Imperial bathhouse.
 51. Pump house (pumps water to drinking fountains at summit of Hot Springs Mountain).
 52. Tower.
 53. Iron Spring (cold).
 54. Dugan-Stuart Building.
 55. Thompson Building.
- North, West, and Hot Springs Mountains and Whittington Lake Park form the permanent Hot Springs Reservation, owned and operated by the Government.

The hot springs issue forth at the foot of Hot Springs Mountain, with an aggregate daily flow of 851,308 gallons. The hot-water supply of the various bathhouses is derived from these springs, and all revenues collected therefrom are, under the direction of the Secretary of the Interior, expended in the improvement, development, and beautification of the reservation. Hot Springs Reservation is coupled with the other national parks throughout the United States, and administered by the Director of the National Park Service, through the superintendent of the reservation, appointed by the Secretary of the Interior.

The superintendent has charge of all general matters pertaining to the Government's interests, is disbursing officer, enforces the rules and regulations of the department, has charge of sanitation, hydrotherapy, and bathing of patients at the Government free bathhouse for the indigent, and supervision of the bath attendants and their fitness for employment.

ADMINISTRATION.

There have been practically no violations of the rules and regulations governing the Hot Springs Reservation during the past year, as the policy of this office has had a very influential effect toward the persons who might be inclined to disregard regulations pertaining to the reservation.

The increased number of visitors to the city of Hot Springs has added greatly to the duties of the reservation office, and I have always had the hearty cooperation of all the employees. Visitors coming to the office in quest of information regarding the city of Hot Springs, the waters, etc., have been efficiently taken care of, as it is the policy of this office to cater to their minutest wants. This is a very important part of the duties of this office, as all trains bring visitors to the office for information; in fact, the visitors are urged to come here by the train inspectors, who make a short talk on the trains before they arrive in Hot Springs, giving a brief description of the city itself, the bathhouses, the waters, etc.

The records of the office are handled in such manner as to give daily, monthly, and annual information in regard to the operations of the bathhouses.

All bathhouses and grounds receive regular inspections, and any irregularities are called to the attention of the managers, with the result that they are at once rectified, as the managers of the bathhouses and the employees of the reservation are in hearty cooperation with each other, all of which tends to keep up the usual high standard of the service.

DRUMMING.

During the past year drumming has been kept down to the extent that hardly a complaint is received, though occasionally we hear of parties engaging in this practice. Upon receipt of any complaints the matter is thoroughly investigated. This constant, careful watch over the situation has practically eliminated drumming.

OFFICIAL VISITORS.

During the latter part of January Assistant Secretary of the Interior Selden G. Hopkins, accompanied by Mrs. Hopkins, arrived in Hot Springs. During their stay here both Secretary and Mrs. Hopkins availed themselves of the benefits of the hot baths. At the end of a month's visit they left for Wyoming, having completed what they most enthusiastically expressed as a delightful stay. Their visit was thoroughly appreciated by the people of Hot Springs.

Arriving in Hot Springs on January 28, Mr. Frank W. Griffith, former chief clerk of the National Park Service, spent three very busy days here in connection with work preparatory to the construction of the new free bathhouse. Mr. Griffith spent two days in Little Rock in conference with Messrs. Mann & Stern, architects for the building. Suggestions and information given by Mr. Griffith during his short stay were very beneficial and expedited matters greatly.

Mr. Arno B. Cammerer, Assistant Director of the National Park Service, favored this reservation with an official visit on March 6, and spent a very busy day going over the reservation and discussing with the superintendent various problems concerning the work here. It was unfortunate that his time was so limited, and it is hoped that he may return in the near future for a more extended visit.

RECEIPTS AND DISBURSEMENTS.

Receipts and disbursements on account of Hot Springs Reservation for the fiscal year ended June 30, 1920, were as follows:

PROCEEDS SALE OF LOTS, SPECIAL FUND.

July 1, 1920, balance remaining to credit of fund of \$82,518 derived from sale of Government lots.....	\$4,972.49
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PROTECTION AND IMPROVEMENT HOT SPRINGS RESERVATION, INDEFINITE (REVENUE FUND).

July 1, 1919, balance to credit of revenue fund.....	\$71,040.82
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Receipts from July 1, 1919, to June 30, 1920, inclusive:	
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Water rents.....	\$35,550.00
Ground rents.....	10,100.00
Sale of attendants' badges.....	25.85
Sale of Oertel System maps.....	7.00

Total receipts.....	45,682.85
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Total available.....	121,696.16
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Disbursements:

Salaries of superintendent and reservation employees-----	\$27,665.36
Vouchers approved by superintendent and forwarded for payment by the department, including travel expenses---	7,275.22
Expended by the superintendent-----	34,940.58
Additional expended by the department-----	769.75
Total disbursements-----	35,710.33
Available balance July 1, 1920-----	85,985.83
Salaries of regular employees on the reservation, account increase of compensation, Department of the Interior, 1920-----	6,514.33

MAINTENANCE AND IMPROVEMENTS.

The regular force of laborers on the Hot Springs Reservation has been constantly employed throughout the year in maintaining the physical improvements on the reservation and in keeping the entire reservation in such condition as to present an attractive appearance.

Blocks of the wide concrete promenade along Bothhouse Row, which were defective and broken, were replaced with new blocks. All defective curbing along the reservation front was removed and replaced with new curbing.

The magnolias, elms, and other species of trees along the reservation front and on the lower slope of Hot Springs Mountain were neatly trimmed, also the trees along Fountain Street and around the old official residence of the superintendent received the same treatment. Twenty-five young maple trees were set out in the vicinity of the superintendent's residence. They are doing exceedingly well and will add greatly to the beauty of the grounds in that vicinity.

During the months of November and December 4,000 tulip and 1,000 hyacinth bulbs were planted in beds along the reservation front, on Hot Springs Mountain, and in Whittington Lake Park. During the early spring months these bulbs bloomed profusely and were the subject of many compliments from the thousands of visitors who were in the resort at that time. In fact, the neat hedges, trim shrubbery, and well-cultivated flowers, as well as wide stretches of grass-covered lawns, have been the subject of much favorable comment.

Much time has been spent in the upkeep of the system of mountain roads and footpaths. The paths have been repaired, cleaned off, and kept in the best of condition, and have been the source of much pleasure to the many visitors who enjoy mountain climbing. Until this year, only the road on West Mountain has been opened to automobile travel, but the winter months were spent in preparing the roads on Hot Springs and North Mountains for automobile traffic. Sharp and narrow turns were widened, portions of the road graded, and iron railings placed at necessary points for safety. Sign boards were placed along the roads for the information and warning of drivers. These roads were officially opened to the public for automobile travel on February 14, 1920, by Gen. John J. Pershing, who was in this city on a tour of inspection.

The general upkeep of the roads consisted of grading, graveling, clearing out gutters and catch basins. In some instances, after heavy rainfall, it has been necessary to almost entirely rebuild portions of the roads. One thousand seven hundred and twenty-five cubic yards of gravel were hauled and distributed on the mountain roads during the year.

The road on North Mountain has not yet been entirely completed, and as often as possible the laborers further the construction work there.

The tennis court in Whittington Lake Park is the only public court in the city and is used daily by numbers of persons. Repairs, such as installing sections of new fence, new nets, etc., have been effected there and the court kept in good condition. The entire park has been kept in a most presentable condition, the flowers, trees, and shrubs being carefully tended. The entire electric-lighting system was generally overhauled and repaired.

The bed on the 2-ton Nash Quad truck received on this reservation was not suitable for hauling and dumping gravel, so a new bed was constructed and placed on the truck. This bed was made of clear white-oak lumber and lined with 24-gauge galvanized iron.

The eight-section Ideal boiler at the Government free bathhouse was taken apart, thoroughly cleaned, two sections repaired, and the boiler reset. A thorough test showed the boiler to be in good condition. In making this repair it was necessary to purchase a new grate and connecting rod.

Pipes in the Maurice Spring were repaired, and the front of the spring inclosure was painted and straightened.

During the cold winter months, the plungers in the pump which supplies drinking water at the pavilion on Hot Springs Mountain adjacent to the tower became frozen and new plungers had to be purchased and installed.

The flooring in the large front porch at the superintendent's official residence was defective to such extent that it was removed and replaced with new flooring and well painted. The back porch at the residence was also repaired and painted.

From time to time large quantities of gravel have been blasted at the gravel pit on Whittington Avenue for use on the mountain roads. Approximately 34 cords of wood were cut and stored for use at the free bathhouse.

GOVERNMENT FREE BATHHOUSE.

The Government free bathhouse has been operated during the past year for the indigent in accordance with the acts of Congress of December 16, 1878, and March 2, 1911, with the following results:

Total applications for free baths-----	5,575
Number refused-----	116

Tickets issued to—	
White males.....	2,623
White females.....	304
Colored males.....	1,503
Colored females.....	1,080
Total tickets issued on original applications.....	5,460
Tickets reissued to—	
White males.....	1,089
White females.....	118
Colored males.....	593
Colored females.....	213
Total number of tickets reissued.....	2,013
Total tickets issued to—	
White males.....	3,719
White females.....	422
Colored males.....	2,107
Colored females.....	1,237
Total tickets issued, including reissued.....	7,485
Baths given to—	
White males.....	48,968
White females.....	6,110
Colored males.....	28,733
Colored females.....	16,858
Total baths given.....	100,669

The number of persons bathing with physicians' bathing directions was 1,182, and the number bathing without bathing directions was 4,278.

The average number of persons bathed daily during the fiscal year was 327.

It will be noted from the above tables, compared with last year's total of 87,040, that there was an increase of 13,629 in the total number of baths given.

FREE CLINIC.

The free clinic, which is operated in the rooms over the Government free bathhouse, has been continued during the fiscal year 1920. Local registered physicians give a portion of their time each day, except Sundays and legal holidays, between the hours of 1 and 3 p. m. to the treatment of indigent free bathers who are unable to secure funds with which to pay for medical treatment.

Wassermann and other blood and serum tests were made in connection with cases treated for the purpose of diagnostic confirmation.

The following diseases were treated in the genito-urinary clinic: Gonorrhea, acute and chronic; cystitis; urethral stricture; rheumatism, gonococcal; epididymitis, gonococcal.

The daily attendance at this clinic averaged, in various months, from 10 to 30, the mean average being 20. The approximate number of personal treatments given was 6,200. During the year 245 persons were dismissed from or left the clinic, with the following results:

No results, insufficient treatment.....	39
Slight improvement.....	57
Much improvement.....	77
Cured.....	72

In the skin-syphilis clinic 114 cases were dismissed or left the clinic, with the following results of treatment:

Insufficient observation.....	16
Slightly improved.....	18
Much improved.....	80

The daily attendance at the skin-syphilis clinic averaged from 2 to 5. These cases were treated for syphilis—primary, secondary, and tertiary.

The 359 cases dismissed from or leaving the genito-urinary and skin-syphilis clinics during the year came from the following States:

States.	Genito-urinary clinic.	Skin-syphilis clinic.	Total.
Alabama.....	14	1	15
Arkansas.....	43	23	66
California.....	2	1	3
Colorado.....	1	1	2
Florida.....	1	2	3
Georgia.....	1	3	4
Illinois.....	19	10	29
Indiana.....	6	1	7
Iowa.....	2	2	4
Kansas.....	7	1	8

States.	Gonito- urinary clinic.	Skin- syphilis clinic.	Total.
Kentucky.....	9	5	14
Louisiana.....	15	4	19
Massachusetts.....	1	0	1
Montana.....	1	1	2
Michigan.....	15	0	15
Minnesota.....	5	0	5
Mississippi.....	20	9	29
Missouri.....	12	10	22
Nebraska.....	5	1	6
New Mexico.....	1	1	2
New York.....	4	2	6
North Carolina.....	0	1	1
Ohio.....	7	4	11
Oklahoma.....	16	16	32
Oregon.....	1	0	1
Pennsylvania.....	1	3	4
Tennessee.....	11	3	14
Texas.....	15	10	25
Virginia.....	2	0	2
Washington.....	4	1	5
West Virginia.....	1	0	1
Wisconsin.....	2	0	2
South Carolina.....	1	0	1
Total.....	245	114	359

NEW FREE BATHHOUSE.

January 31, 1920, marked the beginning of the construction of a new Government free bathhouse, which has been sorely needed for the past few years. Assistant Secretary Selden G. Hopkins officially broke ground on block 82 of the city of Hot Springs, which block had been donated to the Government by the city for bathhouse and clinic purposes. Actual construction was begun on the building February 23, 1920, and a relatively small force of workmen employed continuously.

At the end of the fiscal year all excavation and outside drain work contracted for had been completed. All the construction buildings, consisting of office and storeroom, truck shed, cement house, and latrine are completed, and the concrete hoisting tower erected in place. Two hundred and eighty-three cubic yards of concrete in foundations and walls are in place. Approximately 18 per cent of the form work has been completed. This includes all columns and beam forms, wall forms to an average height of 8 feet above the first floor.

Contracts have been entered into for furnishing practically all the necessary material for completion of construction and a large part of the material received and stored on the site of the work.

It is anticipated that during the coming fiscal year this building will be entirely completed, equipped, and put in operation and that the Government will offer to the indigent who come to Hot Springs all the facilities of a modern bathhouse and clinic.

The construction of this building is being accomplished under the direction of Col. John R. Fordyce, constructing engineer. At the conference of national-park superintendents, held in Denver, Colo., November, 1919, Col. Fordyce offered his services to the Government without compensation other than nominal. His offer was accepted and he was made constructing engineer of the National Park Service. Col. Fordyce has been untiring in his efforts to complete this project, as well as in developing other needed improvements, and his efficiency, skill, and experience, coupled with his keen public spirit, are very highly appreciated by the citizenship of Hot Springs as well as the National Park Service.

PAY BATHHOUSES.

There are at present 19 pay bathhouses in Hot Springs receiving hot water from the Hot Springs Reservation, with the following rates for baths, fixed in each instance by the Secretary of the Interior, and in effect therein:

Bathhouse.	Single bath.	Course of 21 baths.	Bathhouse.	Single bath.	Course of 21 baths.
Alhambra.....	\$0.55	\$10.00	Maurice.....	\$0.75	\$14.00
Arlington.....	.80	15.00	Moody.....	.65	12.00
Buckstaff.....	.75	14.00	Ozark.....	.55	10.00
Eastman.....	.70	13.00	Ozark Sanitorium.....	.60	11.00
Fordyce.....	.80	15.00	Pythian (colored).....	.50	9.00
Hale.....	.65	12.00	Rector.....	.60	11.00
Imperial.....	.70	13.00	Rockafellow.....	.60	11.00
Lamar.....	.60	11.00	Superior.....	.65	12.00
Magnesia.....	.55	10.00	St. Joseph's Infirmary.....	.65	12.00
Majestic.....	.70	13.00			

The above rates became effective January 1, 1920, being an increase of 15 cents per single bath and \$3 per course of 21 baths in the former rates at all bathhouses.

In addition to the above there is a uniform attendant's fee, also fixed by the Secretary of the Interior, of 20 cents for a single bath, or \$4 per course of 21 baths, which is collected by the bathhouse manager and properly accounted for to the attendant. All bathhouses sell half-rate tickets for 10 baths, and some of the bathhouses sell quarter tickets for 5 baths, at one-half and one-fourth, respectively, of the rates shown above for full course of 21 baths.

There are 23 hot-water and ground leases in force at present, as shown by the following table:

Hot-water and ground leases.

Name of bathhouse, etc.	Lessee.	Tubs.	Date of lease.	Expiration.
Alhambra.....	Alhambra Bathhouse Co.....	18	Mar. 1, 1919	Feb. 28, 1922
Arlington ¹	Arlington Hotel Co.....	92	Mar. 21, 1914	Mar. 3, 1932
Buckstaff.....	Buckstaff Bathhouse Co.....	31	Jan. 1, 1912	Dec. 31, 1931
Eastman ¹	New York Hotel Co.....	89	May 13, 1912	May 12, 1932
Fordyce.....	S. W. Fordyce, jr., trustee	30	Jan. 1, 1915	Dec. 31, 1934
Hale.....	Mercantile Trust Co., trustee	25	do.....	Do.
Horseshoe ²	D. Fellows Platt.....	30	Jan. 1, 1895	Dec. 31, 1909
Imperial.....	Chas. N. Rix.....	27	Jan. 1, 1912	Dec. 31, 1931
Lamar ³	M. C. Tombler and G. H. Buckstaff.....	30	Jan. 1, 1897	Dec. 31, 1916
Levi Memorial.....	Leo N. Levi Memorial Hospital Association.	5	Nov. 1, 1914	Oct. 31, 1924
Magnesia ³	Chas. B. Platt.....	30	Jan. 1, 1895	Dec. 31, 1909
Majestic ¹	Avenue Hotel Co.....	23	Jan. 1, 1913	Dec. 31, 1932
Maurice.....	Maurice Bath Co.....	29	Jan. 1, 1912	Dec. 31, 1931
Moody ^{1,3}	New Moody Hotel Co.....	16	July 1, 1910	June 30, 1920
Pythian (colored).....	Knights of Pythias (colored).....	10	May 13, 1912	May 12, 1932
Rector.....	Elias W. Rector Estate.....	12	Apr. 16, 1914	Apr. 15, 1924
Rockafellow ³	Mahala J. Rockafellow.....	18	July 1, 1918	June 30, 1920
St. Joseph's Infirmary ¹	Sister superior.....	10	Feb. 1, 1914	Jan. 31, 1924
Superior.....	Superior Bathhouse Co.....	20	Feb. 15, 1916	Feb. 14, 1936
Arlington Hotel ground lease.	Arlington Hotel Co.....	.....	Mar. 21, 1914	Mar. 3, 1932
Hot Springs Mountain Observatory ground lease.	Hot Springs Mountain Observatory Co.....	.....	Sept. 1, 1913	Sept. 1, 1923

¹ Water used in private bathrooms in portion of tubs leased.

² Closed Dec. 31, 1915.

³ Tenants holding over.

Total receipts, less redemptions, of bathhouses, by months, for fiscal year ended June 30, 1920.

Bathhouse.	July.	August.	September.	October.	November.	December.
Alhambra.....	\$1,328.05	\$1,232.75	\$1,240.15	\$1,128.25	\$817.95	\$1,294.65
Arlington.....	1,705.65	1,643.85	1,531.30	2,322.40	2,428.40	2,131.25
Buckstaff.....	3,460.75	3,970.75	2,694.45	2,300.30	2,351.00	3,784.55
Eastman.....	4,502.47	4,138.10	2,958.19	3,067.40	3,016.15	3,455.94
Fordyce.....	2,199.95	2,247.70	1,708.40	1,431.20	1,879.45	2,178.40
Hale.....	2,295.95	2,688.70	1,932.80	1,726.60	1,212.35	1,862.30
Imperial.....	1,705.55	1,751.60	1,180.80	1,050.20	1,173.45	1,648.55
Lamar.....	1,327.30	1,186.50	1,162.85	849.20	742.60	1,267.00
Magnesia.....	1,929.35	1,855.10	1,523.05	1,099.05	1,089.55	1,387.45
Majestic.....	3,301.50	3,753.15	2,624.25	3,132.60	3,108.65	4,213.47
Maurice.....	788.96	1,106.36	688.52	515.98	616.62	711.46
Moody.....	2,002.60	2,197.20	1,989.65	1,531.45	1,581.90	2,377.85
Ozark.....	603.15	928.70	451.70	447.15	402.70	761.25
Ozark Sanatorium.....	1,052.65	1,201.15	875.80	849.75	550.40	421.15
Pythian (colored).....	399.55	519.80	498.10	476.30	366.70	800.26
Rector.....	1,530.70	1,860.50	1,359.45	1,030.65	1,063.53	2,077.86
Rockafellow.....	2,018.40	2,410.35	1,374.25	1,423.95	1,519.45	1,608.45
Superior.....	338.20	286.50	346.35	313.57	351.07	323.57
St. Joseph's Infirmary.....						
Total.....	32,490.73	34,978.76	26,130.06	24,699.10	24,294.92	32,504.69

Total receipts, less redemptions, of bathhouses, by months, for fiscal year ended June 30, 1920—(Continued.)

Bathhouse.	January.	February	March.	April.	May.	June.	Total.
Alhambra.....	\$1,690.35	\$1,457.55	\$1,670.85	\$1,711.80	\$1,715.75	\$1,915.25	\$17,283.45
Arlington.....	4,856.20	5,667.65	5,846.35	4,171.60	3,516.95	2,270.20	28,091.80
Buckstaff.....	4,904.50	5,546.15	6,392.45	5,944.65	5,005.05	4,883.30	51,237.90
Eastman.....	1,858.20	5,636.10	5,908.75	885.40			14,289.45
Fordyce.....	6,978.51	6,798.95	9,298.98	6,461.91	5,282.91	5,786.52	61,746.03
Hale.....	3,111.65	3,334.90	3,387.00	3,161.80	3,500.20	2,854.65	30,995.30
Imperial.....	3,073.20	3,475.95	3,451.80	3,176.10	3,454.60	3,297.75	31,648.10
Lamar.....	2,040.60	2,291.00	2,464.25	2,540.00	2,234.90	1,803.55	20,284.25
Magnesia.....	1,749.90	1,989.20	2,021.50	2,018.35	1,867.20	1,635.20	17,806.80
Majestic.....	2,873.40	2,817.65	3,919.70	2,827.80	2,694.45	1,606.10	25,611.65
Maurice.....	6,977.15	7,635.10	7,049.85	5,281.70	5,010.45	4,448.55	56,533.42
Moody.....	1,671.40	1,847.15	2,030.28	1,673.61	1,067.60	1,571.35	14,282.29
Ozark.....	2,808.50	2,804.45	2,878.10	2,370.05	2,855.75	2,713.40	28,110.40
Ozark Sanitorium.....	690.60	793.80	1,103.70	910.25	1,037.75	1,229.55	9,360.30
Pythian (colored).....	848.60	1,659.00	2,012.20	1,507.55	1,451.15	1,529.60	13,965.00
Rector.....	629.05	858.90	1,394.30	1,148.35	1,013.55	754.05	8,848.90
Rockafellow.....	2,003.88	2,326.01	2,680.27	2,563.06	2,602.18	2,526.80	23,644.88
Superior.....	4,161.85	2,960.05	3,912.30	2,777.00	8,244.50	3,822.60	31,233.15
St. Joseph's Infirmary.....	516.30	625.00	744.90	749.65	592.15	534.00	5,721.26
Total.....	53,433.84	60,614.56	68,157.53	51,879.78	48,127.09	45,181.42	502,493.33

Business of the bathhouses for the fiscal year ended June 30, 1920.

Bathhouse.	Whole tickets.	Half tickets.	Quarter tickets.	Single tickets.	Total baths sold.	Baths redeemed.	Net paid baths.
Alhambra.....	1,664	868	191	1,926	46,505	4,516	41,989
Arlington.....	1,712	2,046		5,122	61,534	9,255	52,279
Buckstaff.....	2,943	1,701	1,227	4,495	87,343	9,720	77,623
Eastman.....	363	1,134		1,922	25,085	3,303	21,782
Fordyce.....	3,021	1,752	968	5,367	91,268	12,996	78,272
Hale.....	2,194	1,753		2,956	66,560	7,402	59,158
Imperial.....	2,183	1,120	663	1,852	62,210	7,693	54,517
Lamar.....	1,440	1,600	851	1,826	52,321	4,135	48,186
Magnesia.....	1,808	990	196	1,822	50,670	8,276	42,394
Majestic.....	1,955	1,300		1,362	55,417	12,588	42,829
Maurice.....	3,379	1,627	1,064	3,330	95,979	11,251	84,728
Moody.....	970	818		1,737	30,287	3,775	26,512
Ozark.....	2,768	1,721	820	2,946	82,384	28,941	53,443
Ozark Sanitorium.....	735	638		1,252	23,067	3,010	20,057
Pythian (colored).....	1,030	1,010	48	2,063	34,033	1,608	32,425
Rector.....	790	382	221	1,139	22,654	9,061	13,593
Rockafellow.....	1,818	1,410		1,731	54,009	4,425	49,584
Superior.....	2,377	1,228	778	2,256	68,343	8,076	60,267
St. Joseph's Infirmary.....	492	152		71	11,923	830	11,093
Total.....	33,742	23,260	7,047	45,175	1,021,592	150,861	870,731

Bathhouse.	Complimentary baths.	Paid for redeemed baths.	Total receipts less redemptions.	Receipts from massage, etc.	Total receipts.	Total expenditures.	Net profits.
Alhambra.....	63	\$1,858.70	\$17,283.45		\$17,283.45	\$10,256.75	\$7,026.70
Arlington.....	256	6,361.95	35,691.80	\$2,400.00	38,091.80	14,896.00	23,195.80
Buckstaff.....	486	6,216.15	47,887.90	3,350.00	51,237.90	31,062.93	20,174.97
Eastman.....		2,146.95	13,888.45	400.00	14,289.45	7,105.00	7,184.45
Fordyce.....	304	8,915.08	52,181.42	9,564.61	61,746.03	29,994.97	31,751.06
Hale.....	42	3,882.60	30,568.85	426.45	30,995.30	15,719.10	15,276.20
Imperial.....	270	4,306.70	30,799.95	848.15	31,648.10	17,896.68	13,751.42
Lamar.....	21	2,733.10	21,737.50	346.75	22,084.25	10,662.08	11,422.17
Magnesia.....	63	3,728.00	17,448.95	337.85	17,806.80	9,978.15	7,828.65
Majestic.....		6,211.85	25,611.65	300.00	25,911.65	16,142.09	9,769.56
Maurice.....	84	7,196.80	52,035.85	4,497.57	56,533.42	30,595.42	25,938.00
Moody.....		2,009.78	14,028.84	253.45	14,282.29	8,236.30	6,045.99
Ozark.....	652	5,788.20	28,110.40		28,110.40	12,307.30	15,803.10
Ozark Sanitorium.....		1,555.10	9,244.25	116.05	9,360.30	6,657.62	2,702.68
Pythian (colored).....		543.05	11,651.50	2,313.50	13,965.00	7,698.20	6,266.80
Rector.....	42	1,812.30	8,848.90		8,848.90	7,239.19	1,609.71
Rockafellow.....		2,212.55	23,022.40	622.48	23,644.88	15,490.65	8,154.23
Superior.....	21	4,291.35	31,233.15		31,233.15	19,911.93	11,321.22
St. Joseph's Infirmary.....		437.69	5,721.26		5,721.26	2,978.75	2,742.51
Total.....	2,304	72,207.88	478,696.47	25,796.86	502,493.33	274,817.01	227,676.32

Fees received by bath attendants in the pay bathhouses for the fiscal year ended June 30, 1920.

Bathhouse.	Gross amount.	Redemptions.	Net amount.
Alhambra	\$8,968.20	\$603.20	\$8,065.00
Arlington	10,941.45	1,678.50	9,262.95
Buckstaff	16,904.00	1,944.00	14,960.00
Eastman	4,904.40	660.60	4,243.80
Fordyce	18,219.34	2,602.51	15,616.83
Ha e	12,873.20	1,480.40	11,392.80
Imperial	12,025.40	1,538.60	10,486.80
Lamar	10,464.20	827.00	9,637.20
Magnesia	10,134.00	1,655.20	8,478.80
Majestic	10,862.40	2,080.50	8,811.90
Maurice	19,520.00	2,250.20	17,269.80
Mooly	5,863.40	755.00	5,108.40
Ozark	16,083.20	5,798.20	10,284.00
Ozark Sanatorium	4,465.40	602.00	3,863.40
Pythian (co.ored)	6,600.60	321.60	6,279.00
Rector	4,372.80	1,812.30	2,560.50
Rockafellow	10,438.20	590.00	9,848.20
Superior	13,193.20	1,615.20	11,578.00
St. Joseph's Infirmary	2,286.20	166.00	2,120.20
Total	199,149.59	29,281.01	169,868.58

RECOMMENDATIONS.

In this report I desire to renew the recommendation contained in my two previous annual reports relative to the comprehensive, permanent improvements for this reservation, plans for which are now in Washington. The construction work on the new free bathhouse now underway marks the beginning of these improvements, and it is recommended that estimates be presented to Congress for approximately \$500,000 to continue such portions of the work as may be determined most important. It is suggested that the construction of the two comfort stations on Bathhouse Row and the new Gorge Road and bridges be provided for as soon as possible. The surface drainage system as originally suggested in J. W. Barnett's report is a much-needed improvement.

In addition, I have to respectfully recommend that rule 6 of the rules and regulations governing all pay bathhouses receiving hot water from the reservation be amended to provide for a bath superintendent, both for men's and women's departments of the bathhouses, to be placed in charge of the bath attendants, who will, of course, be under the supervision of the superintendent of the reservation. This is deemed necessary in order that a closer supervision may be kept over bath attendants, who are inclined at times to be a trifle lax in the performance of their duties.

It is also recommended that the road on the top of West Mountain to the reservation line be completed, provided, however, that the city and county continue the road on top of and around the mountain connecting with the reservation line and completing the road to Whittington Avenue.

YELLOWSTONE NATIONAL PARK.

HORACE M. ALBRIGHT, superintendent, Yellowstone Park, Wyo.

GENERAL STATEMENT.

Yellowstone National Park was established by act of Congress approved March 1, 1872.¹ In the act of dedication the purpose of the park was set forth as "a pleasuring ground for the benefit and enjoyment of the people," and part of this expression was cut in the eternal stone forming the splendid northern entrance arch near Gardiner, the cornerstone of which was laid by President Theodore Roosevelt in April, 1903.

The park lies in the three States of Wyoming, Montana, and Idaho. It is rectangular in shape, the north and south boundaries being 54 miles long and the east and west boundaries 62 miles in length. On the north a strip more than 2 miles in width lies in the State of Montana, and on the west the Wyoming line lies about 2 miles within the boundary of the park. Thus territory on the west side of the park lies in both Montana and Idaho, the Idaho section lying south of the Continental Divide, which up to the Wyoming boundary forms the irregular dividing line between the States of Idaho and Montana.

The area of the park is 3,348 square miles, or 2,142,720 acres, of which 3,114 square miles, or 1,992,960 acres, are in the State of Wyoming, 198 square miles, or 126,720 acres, in the State of Montana, and 36 square miles, or 23,040 acres, in the State of Idaho.

With one exception Yellowstone National Park is the largest park in the world, being exceeded in size only by Jasper National Park belonging to the Dominion of Canada and not yet extensively developed.

The altitude of the park varies from less than 6,000 to 11,155 feet, the summit of Electric Peak.

No changes have ever been made in the boundaries of the park since it was created in 1872. Legislation now pending in Congress proposes to add the region, including the headwaters of the Yellowstone, the Teton Mountains, and an intervening mountain area of great charm and beauty. There is also under consideration a modification of the east boundary line to include the headwaters of the Lamar River.

¹ Secs. 2474 and 2475. R. S. (17 Stat., 32.)

ADMINISTRATION OF THE PARK.

After the park was created in 1872 no appropriations were made for its administration, protection, or maintenance for a period of six years. During the greater part of this time the park was cared for by the first superintendent, Mr. N. P. Langford, who served without salary and paid all of his expenses from personal funds. Beginning with June 20, 1878, small appropriations were made for the park, the money to be expended under the direction of the Secretary of the Interior. However, dissatisfaction arose in Congress with the administration of the park, largely because of repeated attempts to secure control of the geysers, Grand Canyon, and other remarkable phenomena, which control it was believed the park officials favored. The result was that there was included in the act of March 3, 1883, authority for the Secretary of the Interior to request the Secretary of War to detail troops to patrol the park. The Secretary of the Interior did not immediately ask for troops, and Congress finally refused to appropriate any funds whatsoever for his use in caring for the park. This made necessary the detail of troops to the park. They arrived on August 20, 1886, under the command of Capt. Moses Harris, who became the first military acting superintendent. With the exception of one brief period, from that time until October 31, 1918, the military force, aided by a few scouts, guarded and administered the park.

In the meantime the Engineer Corps of the Army was charged with the construction and maintenance of physical improvements, principally roads, bridges, and trails.

NATIONAL PARK SERVICE CONTROL.

Under the act of July 1, 1918, funds were appropriated for the establishment of a civil administration, including the necessary executive officers and a civilian ranger force. Under this act, also, all improvement work was transferred from the Corps of Engineers to the Interior Department. Thus all park activities were combined under one head. The park was given the same type of control that had theretofore been established in other parks. Fort Yellowstone was abandoned, and is now the headquarters of the superintendent and his civilian force.

The wisdom of this move has been demonstrated each season since the military control ceased. Not only has the civilian administration been more effective in protecting the park, but it has very much better correlated the different park activities, and has brought about an immense reduction in the cost of operating the park.

ORGANIZATION OF THE PARK.

The assistant superintendent and the purchasing agent, who is also the disbursing officer, handle matters in the general headquarters office, buying supplies and keeping the financial and other books of the park, disbursing funds, preparing official reports, handling appointments, and attending to the multitude of other matters naturally appertaining to a large Government office and required by the laws, rules, and policies governing the National Park Service.

The resident engineer supervises the road maintenance and construction and other physical improvements.

The chief ranger is in charge of the protection of the park, the operation of the buffalo and hay ranches, the care of wild animals, the fighting of forest fires, and similar activities.

The park naturalist is in charge of the information office and all scientific work carried on in the park, either under the park service or by scientists working in the park under authority from the department. He also is charged with the inspection of the forests for the detection of disease, and has charge of wood-cutting and timber operations, when dead and down timber is needed for wood, or live timber for the construction of buildings. He also edits and keeps up to date the park publications.

The master mechanic supervises and controls the shops, which include well-equipped blacksmith, machine, automobile repair, motor cycle repair, and carpenter shops.

The master of transportation has charge of all freighting operations, the warehouses, the checking of incoming and outgoing supplies, inventories of park property, and in general all matters relating to the transportation, distribution, and use of the property.

The chief electrician operates the power plant at headquarters, supervises all electrical installation in the Government buildings and the establishments of the public utilities, maintains all power lines and the street lighting system.

The chief lineman is charged with the maintenance and operation of the telephone system, including the upkeep of 247 miles of telephone lines and the operation of the switchboard at headquarters.

The master plumber has control of the water and sewer systems at headquarters, the sanitary systems of the various hotels and camps throughout the park, the public automobile camps, and the construction of new camps, including the installation of water and garbage disposal systems, is under his supervision.

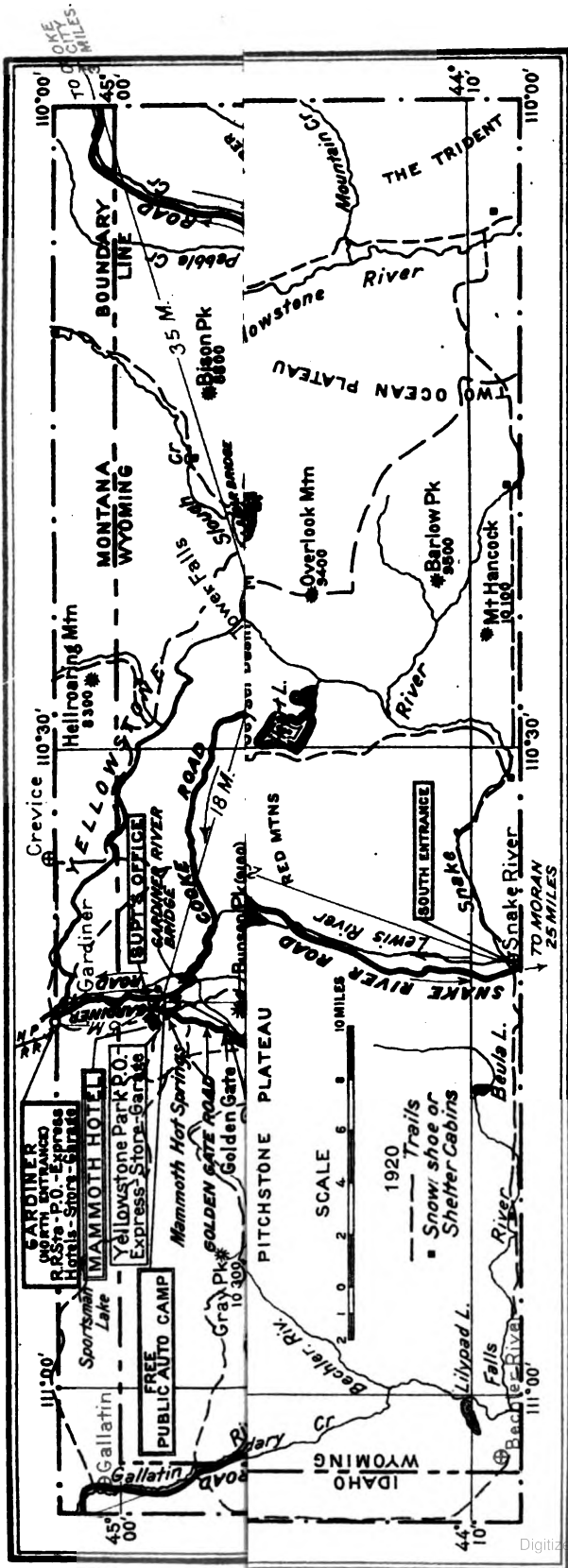
The master painter supervises all painting operations in the park, both by the Government and the hotel, camp, and transportation utilities. He personally does most of the painting of Government property. He also has charge of sign painting and the installation of signs throughout the park.

I have briefly mentioned only a few of the duties performed by these various departments. It is a pleasure to record that without the perfect functioning of this organization during the past season the tremendously successful results of the year never could have been accomplished.

HEADQUARTERS.

The headquarters of the park are located at Mammoth Hot Springs, the buildings of the abandoned Fort Yellowstone being used for general offices, shops, and homes for park employees. Here it is our desire and intention to establish, as soon as funds are available, a museum not only for the benefit of tourists but also for the use of scientists who come here each year in great numbers for the purpose of studying botany, zoology, geology, and other subjects.

Connecting headquarters with the various ranger stations in the park are 247 miles of telephone lines.



DERIVED AND PRINTED BY THE U.S. GEOLOGICAL SURVEY

MAP OF YELLOWSTONE NATIONAL PARK

- ⊕ Denotes Ranger Station ↖ Direction of Travel
 Distances given are between main points by road.
 NOTE THE MILE-POST SIGNS!

JURISDICTION OVER OFFENSES.

When Yellowstone National Park was established this part of the West was embraced within Territories under the complete control of the Government, and when, later, States were carved out of these Territories, exclusive jurisdiction over Yellowstone Park was retained by the Federal Government. On May 7, 1894, the President approved the act providing for the punishment of offenses in the park, such punishment to be administered under the Federal law by a United States commissioner, who was given authority to punish misdemeanors and violations of the regulations by the imposition of fines up to \$500 or imprisonment of six months, or of both fine and imprisonment. In case of felony the commissioner has the power to bind over suspects upon the determination of probable cause to the Federal court at Cheyenne. Hon. J. W. Meldrum is United States commissioner and is the only man to ever hold this office.

WEATHER BUREAU.

One of the main branches of the United States Weather Bureau is located at headquarters and is in charge of Mr. Edgar Fletcher. He makes all of the observations and reports usually required from offices of this size and importance by the United States Weather Bureau. In the work of observing weather conditions, the rangers at the various stations in the park assist. A full report of weather conditions during the past year, compiled with the assistance of Observer Fletcher, is published in another part of this report.

POST OFFICE DEPARTMENT.

The post office of the park is Yellowstone Park, Wyo., and is located at headquarters. Without doubt branches should be established before the opening of another season at Upper Geyser Basin, the outlet of Lake Yellowstone, and the Grand Canyon, with Post Office Department trucks carrying the mail from the main office to these branches. There is another post office located at West Yellowstone, Mont., which prior to January, 1920, was called Yellowstone, Mont. Confusion in the transmission and distribution of mails was responsible for the change in name to West Yellowstone. While conditions have been better this year, the change did not accomplish all the results that were expected. There is also a post office at Gardiner, Mont., near the northern gate, from which a star-route delivery is made to several stations along the road through the northeast corner of the park to Cooke City, Mont., as well as to Cooke City itself. Frank Lind, of Gardiner, is the contractor for carrying mail on this route. The transportation of mails from Gardiner to headquarters is handled under contract by the Yellowstone Park Transportation Co.

BUREAU OF FISHERIES.

The Bureau of Fisheries maintains a hatchery at Lake Yellowstone and stations for collecting eggs in other parts of the park. A further report of its activities on its own behalf and in cooperation with the National Park Service is published in those sections of this report which relate to fish and fishing.

BUREAU OF MINES.

At the request of the National Park Service, the Director of the Bureau of Mines detailed his chief mining engineer, Mr. George S. Rice, to make a study of the coal mine in Mount Everts, with a view to ascertaining whether or not it would be advisable for the National Park Service to develop it, in order to meet the fuel needs of Mammoth Hot Springs. Mr. Rice arrived in the park on August 16 and left on the 19th. While he has only filed a preliminary report on his findings, his recommendation will be that no further development work be done in the Mount Everts mine, because there is no evidence that it would be a producer of good coal at reasonable cost.

BUREAU OF ANIMAL INDUSTRY.

Each year the Bureau of Animal Industry details one of its scientists to assist in the vaccination of the tame buffalo herd. The cooperation of the Bureau of Animal Industry in the care of the buffalo herd has been an exceedingly important thing, and the effective results that it has obtained are deserving of the utmost appreciation of the National Park Service.

UNITED STATES GEOLOGICAL SURVEY.

The Geological Survey maintains gauging stations for the measurement of stream flow and the recording of other data in regard to certain waters of the park, particularly the Yellowstone, Snake, and Madison Rivers. While these gauging stations have some educational value, in my opinion they are detrimental to the park, and certainly they are of no value in our operations. The stations affect the park adversely because they record data that may later be used in the development of schemes for commercializing the park in one way or another.

FOREST SERVICE.

Yellowstone Park is almost surrounded by seven national forests, the Absaroka, Bear-tooth, Shoshone, Teton, Targhee, Madison, and Gallatin. We cooperate with the supervisors of all of these forests in fire-protection activities and in the care of game. The most cordial relations have always existed between the administration of the park and the forest officers with whom we have come in contact.

RAILROADS AND HIGHWAYS TO PARK ENTRANCES.

There are four main gateways to Yellowstone Park, all of which are approached by automobile roads, and three of which have both train and automobile service.

NORTHERN GATEWAY.

The northern, or Gardiner, gateway is reached via the Northern Pacific Railway. This is a branch line from Livingston, 53 miles distant. During the 1920 season two trains a day were operated over this branch, the morning train arriving at Gardiner at 11.25 and departing at 11.45, and the evening train arriving at 5.30 and departing at 7.30. On both the incoming morning train and the outgoing evening train through Pullman cars were carried for the purpose of giving through connections with eastern and western trains on the main line. As will be noted in the tables of travel statistics, these trains carried 9,717 visitors to the park during the season, and 9,175 leaving the park availed themselves of this train service.

The automobile road from Livingston south to Gardiner during most of the season was in a poor state of repair. This observation does not apply to the 10 miles of road immediately north of the park, as this strip was improved by Gardiner citizens, aided by the National Park Service and the park utilities, who, prior to the opening of the season, regraded this part of the road and surfaced large sections of it with cinders. However, the road north of Yankee Jim Canyon was badly rutted, rocky, and rough during most of the summer.

EASTERN GATEWAY.

The eastern, or Cody, gateway is 55 miles from the town of Cody, which is situated at the terminus of the Chicago, Burlington & Quincy Railroad. The Burlington operated two trains a day, carrying through Pullman cars from eastern and southern points, as well as one local train. The through trains arrived at 6 a. m. and 12.50 p. m. and departed at 9 a. m. and 8 p. m., and the local train reached Cody at 7.10 p. m. and left at 3.35 p. m. Visitors coming from northern and western points changed trains at Billings, Mont. The Burlington service at Cody was used by 4,075 visitors to the park, and 4,563 visitors upon completing their tour left via the Burlington Route.

Automobile roads converging at Cody from Wyoming and Montana points were generally in excellent condition. The Yellowstone Highway, leading north from Cheyenne through Douglas, Casper, Shoshoni, and Thermopolls was in excellent condition, with the exception of one short stretch of road north of Shoshoni. These Wyoming roads were never in better condition than they were this year.

The plan favored by the governor and the highway commission for the early construction of a road through the wonderful Wind River Canyon is attracting widespread interest among motorists. Work has progressed continually on the road across the Big Horn Mountains, which will be a part of the Black and Yellow Trail, a scenic route from the East which is being actively promoted by several States, especially South Dakota and Wyoming. The approach road from Cody to the park was in unusually good condition this year. The tremendous increase in traffic brought grave fears that dangerous accidents would occur in the box canyon of the Shoshone where the dam is located. These fears prompted the placing of more signs at both ends of the canyon, and plans have now been made for the establishment of a block system for the control of traffic during the season of 1921.

WESTERN GATEWAY.

The western gateway is at the town of West Yellowstone, Mont. It is reached by the Yellowstone Park branch of the Oregon Short Line Railway. The Yellowstone special, a solid Pullman train, was operated from Salt Lake City, leaving at 8.30 in the evening and arriving at 8 in the morning at West Yellowstone. Trains leaving the park departed at 7 in the evening. This gateway holds the record for train passengers, 14,268 visitors entering the park via the Oregon Short Line trains, and 14,322 people utilizing this train service after finishing their tour of the park.

The automobile roads approaching the western gateway from Utah and Idaho points were in better condition than they were last year, but considerable improvement work remains to be done on the main road from Salt Lake City on the section north of Ashton. The Ruby Valley and Madison River Valley routes from Montana points were well maintained, but the road from Bozeman up the Gallatin Valley was closed part of the season on account of construction work. As noted last year, the Gallatin Valley Road is being entirely rebuilt, and when finished this highway will be one of the best and most scenic roads approaching the park.

SOUTHERN GATEWAY.

The southern gateway is 23 miles south of the main loop road system of the park, and is located near the Snake River. Roads converging at Sheffield's resort (Moran post office), 25 miles south of the park, connect southern and central Wyoming points, as well as Idaho communities, with the park road system. The park service maintained a road in the Teton Forest over a distance of 30 miles south of the park. The road under construction through the valley of the Hoback River, south of the Jackson Hole, was not in condition for automobile travel this year, but it is being rapidly improved by the State in cooperation with the Federal Government. Interference with ferry service by the ravages of the Snake River made it necessary for motorists coming into the Jackson Hole from Idaho points by way of Teton Pass to move northward along the west side of the Snake and cross the dam at the foot of Jackson Lake. After the ferry service was reestablished many motorists chose to cross the Snake at Jackson and come north over the main Jackson Hole highway through the community of Kelly and thence to the Buffalo Fork of the Snake.

The roads in the lower Jackson Hole were not in as good condition as usual, due to the long winter and late spring, which not only made the roads soft but prevented early maintenance work. The Wind River route, approaching the park from Lander, Riverton, and Dubois, by way of Twogwotee Pass, was used this year by more motorists than ever. This highway is being rebuilt by the State and Federal Government, and when finished will be an unusual scenic route. It should be in a few years one of the most popular approaches to the park. It connects with the park road system at the Buffalo Fork approach, a few miles east of Moran.

NORTHWESTERN GATEWAY.

The northwestern gateway was used very little by tourists this year on account of the reconstruction of the Gallatin Road. It will be open for travel next year, but the improvement work will not be finished until the season of 1922.

NORTHEASTERN GATEWAY.

The northeastern or Cooke City entrance is unimportant so far as tourist travel is concerned. More than the usual number of tourists visited the Cooke City region this year, but that section will never be as popular as it deserves to be until the road which is being constructed from Red Lodge and Bear Creek, Mont., to Cooke City is completed. Construction work is proceeding slowly, and it will be several years before the road is available for automobile travel.

ROAD SYSTEM OF THE PARK.

There are 278.8 miles in the main park road system and 24.75 miles of secondary highway. Under a special act of Congress, we also maintain 28 miles of the approach road in the Shoshone National Forest, which is a part of the main highway between Cody and the park. Also, under similar special authority, 30 miles of the main approach road from the south, in the Teton National Forest, are maintained and repaired each year under Yellowstone Park appropriations.

TRAIL SYSTEM OF THE PARK.

There are 620 miles of trails in the park, 27½ miles of which were constructed during the season of 1920.

TRAVEL OF THE 1920 SEASON.

By a considerable margin this has been the largest tourist season in the history of Yellowstone National Park. Last year 62,261 visitors were recorded at the various gateways of the park, and this year the total reached 79,777, an increase of 28 per cent. This great increase in numbers is more remarkable than mere numbers would indicate. In the first place, the very late spring in the Western States was undoubtedly discouraging to people contemplating motor trips to the park. Again, the summer weather in all of the surrounding States, as well as on the plains, was not what one could call uncomfortable in any sense of the word. Furthermore, due to the long winter and late spring, followed by many summer storms, road conditions in many Western States were not as good as last year. Nevertheless, more motorists visited the park then than ever before, and there were far more visitors from distant points than usual.

In the following tables there are some very interesting and striking figures regarding the distribution of the 1920 travel. It should be especially noted that the train travel greatly increased this year. This fact is particularly striking when it is pointed out that the railroads did practically no advertising, either before or during the season. Next year, should an active advertising campaign be undertaken, the train travel, despite increased rates, should go far beyond that of the present season, and this is to be expected because it is understood that all of the railroads approaching the park expect to advertise the Yellowstone extensively, beginning early in the new year.

It should be noted that the eastern entrance, which a few years ago enjoyed only a negligible patronage, this year forged ahead of the other entrances in the number of private motorists, thus becoming the most popular entrance in the eyes of the motoring public.

On the other hand, the western entrance at the close of the season stood far ahead of the others in the number of visitors arriving by train.

The largest travel for one day during the 1920 season was 1,498 tourists, who entered the park on August 2. This is to be compared with 1,255 tourists who entered on August 5, 1919. The greatest train travel occurred on August 10, when 665 people were carried to the various gateways. The heaviest train travel for a single gateway was 381, arriving at West Yellowstone, Mont., on the Oregon Short Line, on August 3. The greatest number of private automobiles entering the park on one day was 273, on August 9. Compare this with 202 on August 4, 1919. The gateway having the largest number of automobiles in a single day was the Cody entrance, on August 4, when 122 entered the eastern gateway, carrying 430 people.

There was also a large increase in the number of people using the trails of the park. It is to be hoped that the "trailers," as they are coming to be called, will increase rapidly each year.

The following tables make various classifications of the 1920 travel, and likewise present comparisons with the travel of previous years that are exceedingly interesting:

TRAVEL BY DIFFERENT ENTRANCES.

From the north, via Gardiner, Mont.....	26, 112
From the west, via West Yellowstone, Mont.....	30, 503
From the east, via Cody, Wyo.....	19, 868
From the south, via Moran, Wyo.....	3, 294
Total.....	<u>79, 777</u>

Yellowstone Park Transportation Co.

Entering via the northern entrance.....	10, 658
Entering via the western entrance.....	15, 395
Entering via the eastern entrance.....	4, 233
	<u>30, 286</u>

MAKING TRIPS WITH PRIVATE TRANSPORTATION.

With automobiles, paid and complimentary.....	45,732	
With automobiles, second trip.....	2,901	48,633
With motor cycles.....	116	
With miscellaneous facilities, including out-of-season visitors to the park.....	742	858
Grand total.....		79,777

Private automobile travel.

	Automobiles.	Tourists.
Entering via the northern entrance.....	4,200	14,961
Entering via the western entrance.....	4,015	14,870
Entering via the eastern entrance.....	4,400	15,580
Entering via the southern entrance.....	878	3,272
Total.....	13,502	48,633

Motor cycle travel.

	Motor cycles.	Tourists.
Entering via the northern entrance.....	27	36
Entering via the western entrance.....	30	44
Entering via the eastern entrance.....	24	32
Entering via the southern entrance.....	3	4
Total.....	84	116

¹ Includes 1 complimentary motor cycle, carrying 2 passengers.

Entrance.	Private transportation.		By rail.	Total visitors.
	Cars.	Visitors.		
1920.				
North.....	4,236	15,454	10,658	26,112
West.....	4,045	15,108	15,395	30,503
East.....	4,424	15,635	4,233	16,868
South.....	881	3,294		3,294
Total.....	13,586	49,491	30,286	1 79,777
1919.				
North.....	3,498	13,433	9,353	22,786
West.....	3,792	14,661	8,997	23,558
East.....	2,860	10,430	3,025	13,455
South.....	623	2,462		2,462
Total.....	10,773	40,986	21,275	2 62,261

¹ Includes 84 motor cycles, carrying 116 passengers.² Includes 36 motor cycles, carrying 56 passengers.

Statement showing automobile travel by States, season of 1920.

Name of State.	North.		West.		East.		South.		Total.	
	Cars.	Passen- gers.	Cars.	Passen- gers.	Cars.	Passen- gers.	Cars.	Passen- gers.	Cars.	Passen- gers.
Alabama.....	2	5	.....	.....	2	4	.....	.....	4	9
Arkansas.....	3	11	4	20	13	44	.....	.....	20	75
Arizona.....	5	15	22	82	10	32	2	12	39	121
Colorado.....	45	147	94	299	335	1,117	12	43	485	1,606
California.....	179	503	291	893	73	335	21	67	564	1,688
Connecticut.....	9	25	1	4	1	2	.....	.....	11	31
Delaware.....	1	3	1	3	1	4	.....	.....	3	10
Florida.....	8	21	5	13	16	44	.....	.....	30	51
Georgia.....	1	3	1	3	2	6	1	3	4	12
Illinois.....	111	351	30	94	177	590	.....	.....	322	1,046
Indiana.....	46	184	12	36	74	248	4	11	132	448
Iowa.....	133	453	40	141	227	805	6	20	405	1,419
Idaho.....	68	242	1,220	4,642	50	190	281	1,143	1,619	6,217
Kansas.....	35	126	62	205	224	772	15	53	336	1,156
Kentucky.....	1	4	3	12	8	21	1	3	14	50
Louisiana.....	1	4	3	13	7	29	.....	.....	11	46
Montana.....	1,829	6,179	658	2,705	374	1,368	14	50	2,675	10,302
Maryland.....	3	9	.....	.....	4	12	.....	.....	7	21
Massachusetts.....	14	39	2	8	19	64	.....	.....	35	111
Maine.....	1	4	.....	.....	4	14	.....	.....	5	18
Michigan.....	76	226	15	58	135	436	2	7	228	727
Mississippi.....	.....	.....	.....	.....	6	19	1	5	7	24
Missouri.....	46	157	37	125	169	597	4	14	256	893
Minnesota.....	206	754	15	55	96	351	.....	.....	317	1,160
New York.....	42	136	12	41	67	222	.....	.....	121	399
New Mexico.....	3	8	8	30	14	50	.....	.....	25	88
New Jersey.....	7	20	3	10	15	46	.....	.....	25	76
New Hampshire.....	2	8	.....	.....	1	6	.....	.....	3	14
Nevada.....	1	2	25	78	4	15	3	10	33	105
Nebraska.....	89	307	60	211	414	1,445	13	37	576	2,000
North Carolina.....	1	6	1	2	.....	215	.....	.....	2	8
North Dakota.....	173	677	8	32	55	215	1	2	237	926
Oklahoma.....	30	105	49	196	190	707	8	34	277	1,042
Ohio.....	54	147	23	53	127	365	3	9	207	574
Oregon.....	74	238	108	374	18	59	7	17	207	688
Pennsylvania.....	20	74	8	27	52	167	.....	.....	80	298
Rhode Island.....	1	3	.....	.....	.....	.....	.....	.....	1	3
South Carolina.....	1	3	1	3	2	7	.....	.....	4	13
South Dakota.....	131	475	8	38	85	305	.....	.....	224	818
Texas.....	15	50	54	184	170	593	10	35	249	862
Tennessee.....	4	12	1	5	5	15	1	2	11	34
Utah.....	15	48	667	2,583	11	28	136	526	829	3,183
Virginia.....	8	27	1	2	5	18	.....	.....	14	47
Vermont.....	1	4	.....	.....	1	3	.....	.....	2	7
Washington.....	320	1,067	189	606	55	211	5	17	569	1,901
Wisconsin.....	136	443	13	42	64	207	1	3	214	695
Wyoming.....	88	317	32	105	914	3,606	95	345	1,129	4,273
West Virginia.....	10	41	1	5	8	27	.....	.....	19	73
District of Columbia.....	4	9	1	5	5	16	2	9	12	39
Hawaii.....	1	2	2	6	.....	.....	.....	.....	3	8
Canada.....	44	163	6	33	6	21	1	4	57	221
Mexico.....	.....	1	7	.....	.....	.....	.....	.....	1	7
Total.....	3,899	13,837	3,798	14,069	4,315	15,266	649	2,481	12,661	45,653
Complimentary cars, unclassified by States.....	.....	.....	.....	.....	.....	.....	.....	.....	35	.....
Motorists entering in complimentary cars, unclassified by States.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	79
Cars and motorists entering, second trip, unclassified by States.....	.....	.....	.....	.....	.....	.....	.....	.....	806	2,901
Grand total, all cars and motorists, classified and unclassified.....	.....	.....	.....	.....	.....	.....	.....	.....	13,502	48,633

ACCOMMODATIONS.

During the season of 1919 about two-thirds of the total travel to the park was of the class traveling in their own automobiles. Of this number it was estimated that about 60 per cent carried their own tents, bedding, etc., and camped out. During the season just passed, 48,633 of the total of 79,777 visiting the park, or 61 per cent, came in their own cars, and while we have no exact data on which to base an estimate, it is the best judgment of rangers and others who have had an opportunity to observe many of these cars that the number of those with their own outfits has increased to about 70 per cent.

The accommodations furnished by all public utilities in the park were, as a rule, of the highest order. The transportation company, hotel company, and camps company are to be congratulated upon the quality of the service rendered, especially with the extreme difficulty that these companies have had for the past three years in securing and keeping experienced help.

The total number of meals and lodgings furnished to guests at the hotels and camps during the season were as follows:

	Meals.	Lodgings.	Total.
Hotels:			
Mammoth Hotel.....	63,632	20,005	83,637
Old Faithful Inn.....	83,796	23,391	107,187
Lake Hotel.....	38,713	16,816	55,529
Canyon Hotel.....	93,146	28,002	121,149
Total.....	279,287	88,214	367,501
Permanent camps:			
Mammoth Camp.....	50,162	18,775	68,937
Geysers Camp.....	65,705	19,320	85,025
Canyon Camp.....	66,904	21,054	87,958
Lake Camp.....	34,589	16,070	50,659
Camp Roosevelt (Tower Falls).....	7,933	2,658	10,591
Total.....	225,293	77,877	303,170

The camps company reports that in addition to the 225,293 meals served to guests as reported above, it served a total of 103,215 meals to its employees.

SERVICE TO THE PUBLIC.

HOTELS.

Hotels were operated throughout the season at Mammoth, Old Faithful, Lake Outlet, and Canyon. The travel tables indicate that almost 57 per cent of the train travel to the park stopped at the hotels. They were filled up with tourists beginning the very first day of the season, and the crowds continued almost constantly until within a few days of its close. The hotels also accommodated many of the travelers who went through in their own cars, but no exact data as to their number are available, for the reason that some of them stop a night or two in hotels, possibly part of the time at permanent camps, and part of the time in their own camps.

The service was excellent, and many went out of their way to express their satisfaction with the excellent service received, commenting specially upon the reasonable rates. The few complaints received were directed mostly at the "graft" practiced by some of the porters, and by head waiters who sold preference in the dining rooms when crowds were so great as to require two or three sittings.

The hotel company constructed a new dormitory for female help at Canyon Hotel, built a new porte-cochère on the front of the Lake Hotel, and made a temporary addition under canvas to the dining room at Old Faithful Inn, giving the dining room added capacity of 125 seats.

This company employed two Chinamen to cultivate the garden on Gardiner River, which furnished an abundance of fresh vegetables for all hotels in the park.

PERMANENT CAMPS.

The Yellowstone Parks Camps Co. maintained permanent camps at Mammoth, Old Faithful, Lake Outlet, Grand Canyon, and Camp Roosevelt, near Tower Falls. The latter, however, was not one of the regular stopping points for railroad tourists, but was maintained as a special camp for those who desired to stop over to rest or fish, as it is located in one of the best fishing regions of the park, and there are many intensely interesting side trips that can be taken from here. This camp was well patronized. Slightly above 43 per cent of the tourists coming to the park by rail and going through with the transportation company patronized the camps, and they also received their share of the patronage of the private motorists. The service was excellent, and about the only complaints received were due to the conditions at Camp Roosevelt, which were the result of the unfinished and consequently unsettled conditions of the camp, which was still in process of construction.

The camps company made excellent progress toward carrying out its plan for a most extensive remodeling and general improvement and enlargement of the camp service to meet the needs of the increased travel. A large central building was constructed of logs at Lake Camp for dining room and lobby. Another similar central building was constructed of logs at Camp Roosevelt. A large, artistic stone fireplace is a feature in each of these buildings.

At Mammoth Camp the old tents were all taken down and new cottage tents with asbestos roofs were built instead. These tents are arranged in rectangles of eight single and three double tents around a court, and in the center of each court is located a water-closet, provided with flush toilets. The sets of tents are arranged in streets, all presenting a very neat appearance. A concrete plunge was also built in connection with Mammoth Camp, 40 by 100 feet in size, 3½ to 5 feet deep, and connected with a natural hot spring by a large pipe. The water is of specially fine quality, and this bath was enjoyed by a large number of tourists and employees during the summer. Dressing rooms were built around three sides of the plunge, but the plan for the further development of this camp contemplates a roof over the plunge and a large amusement hall in connection with it.

TRANSPORTATION SERVICE.

The Yellowstone Park Transportation Co. furnished first-class automobile passenger service throughout the tourist season, meeting all incoming and outgoing passenger trains of the park branch of the Northern Pacific Railroad, at Gardiner, Mont., at the northern gateway; of the Oregon Short Line Railroad, at the West Yellowstone, Mont., gateway; and of the Burlington Railway at Cody, Wyo., 55 miles east of the eastern gateway, June 20 to September 20, inclusive. This company had in operation 125 ten-passenger automobiles and 40 seven-passenger touring cars. Of these, 20 seven-passenger touring cars were hired from outside parties, the balance being White cars belonging to the company. During the 93 days, a total of 30,286 passengers were carried an average distance of 211.9 miles each. As an example of the heavy demands made upon this company, some days during the height of the season they were called upon to move as high as about 2,500 tourists from one station to the next, the stations varying from 5 to 100 miles apart.

The arrangement of selling tickets so that tourists may enter at one gateway and return by the same one, or either of the other two, gives a series of combinations which make up nine different trips, varying in length from 149.3 to 302.7 miles, averaging 211.9 miles. The standard rate for any of these trips is \$25, an average of 11.8 cents per mile. Carefully prepared schedules, which must be adhered to unless good reasons for variation can be given by the drivers, made it possible to tell the whereabouts of any car with reasonable accuracy at any time, and the machine-like adherence to these schedules which characterized the wonderful organization of this company brought from tourists many expressions of admiration as to the efficiency which was apparent.

The big cars are most comfortable. Additional charges are made to parties desiring the exclusive use of a seven-passenger car, and in such cases the car is placed entirely at their disposal, may be used for side trips, and more latitude is permitted as to schedule, etc.

The drivers were carefully selected before the season opened from many applicants. They are not only skilled but are required to be always obliging, courteous, and careful. Not only were they solicitous of the safety, comfort, and pleasure of their passengers, but were also thoughtful and courteous to private automobile tourists encountered along the road, and many tourists of both classes took pains to express their commendation of certain drivers, or sometimes of the yellow cars in general. These conditions were in marked contrast to the service and attitude of this company's drivers during the season of 1919, when reckless driving, discourtesy, and disregard of park regulations characterized their service.

Marked improvement in service at the transportation company's garages, which are maintained at Mammoth, Upper Geyser Basin, Lake Outlet, and Grand Canyon, was also apparent; but this service is still far from satisfactory, and does not compare favorably with the service given private motorists at the garages found in the small villages near the park entrances. This condition is a result of the fact that the importance of keeping the company's cars in running order overshadows the demands of the private motorist for quick repair service, and often there are not sufficient mechanics employed to keep both up to a maximum degree of efficiency.

Tourists in each car were furnished with copies of the company's time tables, and were invited to see to it that the driver followed the schedules. These time tables covered every trip made by the cars between stations. No. 1, Gardiner to Mammoth, is copied below as a sample.

Yellowstone Park Transportation Co. 1920 time table.

[Corrected to July 8.]

EXPLANATION.

Column 1.—Gears drivers are to use between stations: Gear shown opposite one station is used to the next station.

Column 2.—Speed of car in miles per hour: Speed opposite one station is used to the next station.

Column 3.—Speedometer readings at stations.

Column 4.—Names of stations.

Column 5.—Stops: When the word "slow" appears, cars are to go ahead at a speed not exceeding 5 miles per hour. On account of the narrowness of the roads and sharp curves, it is impracticable for cars to come to full stop at many stations, on account of the consequent blocking of roadway.

Column 6.—Time table for car leaving initial point at time shown.

Column 7.—Passengers are invited to look at their watches on leaving the starting point, and to fill out this column accordingly. For instance, a car leaving Mammoth at 8.10 a. m. on time table No. 2 would arrive at the different stations 10 minutes later than shown in column 6.

Column 8.—Passengers are invited to enter in this column the actual arriving time of their cars at the different stations. By checking this time against column 6 you can tell whether you are running on schedule or not.

Note for drivers.—On cars numbered over 185 use one gear higher than shown in schedule.

These schedules are subject to necessary changes as a result of experience in operation.

NATIONAL PARK SERVICE, YELLOWSTONE NATIONAL PARK.

HORACE M. ALBRIGHT.

Superintendent, Yellowstone National Park.

Approved June 10, 1920.

TABLE NO. 1.—*Gardiner to Mammoth.*

Gear.	Miles. per hour.	Miles.	Stations.	Stops.	Time first car arrives.	Your car should arrive.	Your car did arrive.
2	10	0.0	Gardiner, Mont.....	.....	11.35 a. m.	.....	.....
3	15	.1	Entrance Arch (NE.).....	.....	11.36 a. m.	.....	.....
2	12	1.6	Bridge and Eagle's Nest.....	.....	11.42 a. m.	.....	.....
3	15	2.1	.....	.....	11.46 a. m.	.....	.....
3	15	2.7	Hotel Garden.....	.....	.....	.....	.....
2	12	3.0	Montana-Wyoming State line.....	.....	11.49 a. m.	.....	.....
2	12	3.5	Bolling River.....	.....	11.51 a. m.	.....	.....
2	12	4.5	Road to left, Tower Falls.....	.....	.....	.....	.....
		4.7	Change to third gear.....	.....	11.56 a. m.	.....	.....
2	10	.....	(Superintendent's office to right.)	.....	.....	.....	.....
3	10	4.9	Mammoth Hotel.....	.....	11.57 a. m.	.....	.....
		5.4	Mammoth Camp.....	.....	12.00 m.	.....	.....

This system worked out splendidly and had much to do with the general satisfaction of the transportation service as expressed by thousands of tourists.

The company last fall remodeled one of the old stage company buildings at Mammoth into a first-class automobile repair and machine shop, and it is admirably equipped to do automobile repairing. Another of the old barns at Mammoth was remodeled into a bunk house for drivers, and at the present writing a steam-heating plant is being installed to serve both the repair shops and bunk house in winter. The boiler for the heating plant is being reclaimed from the Fountain Hotel, which has been abandoned for several years.

A new gas-filling station has recently been built by this company at Mammoth Hot Springs, on a site between the post-office store and the Cottage Hotel, and was in operation toward the close of the season. The construction of another new filling station near Whittaker's general store at Canyon Junction has just been begun.

MISCELLANEOUS SERVICE.

Mr. J. E. Haynes, official photographer, maintained picture shops at his headquarters at Mammoth Hot Springs, Old Faithful, and Tower Falls. He also sold his photographic wares from stands in all hotels and camps, and through the general stores in the park. Mr. Haynes built a new picture shop at Mammoth Hot Springs, near his residence on Avenue A, on plans approved by the National Park Service. The new building, as well as the driveway, cement walk, and ornamental illuminated sign in front, are all very attractive and a decided credit to the park.

Mr. George Whittaker maintained his general store in connection with the post office at Mammoth Hot Springs, and also maintained a complete general store at Canyon Junction. His new log building at Canyon, which was constructed late last fall and in early spring under most difficult circumstances, is very attractive, and is conveniently located for private automobile tourists.

Mr. C. A. Hamilton maintained his two general stores at Upper Geyser Basin and at Yellowstone Lake Outlet, and was also permitted to operate a small branch store at Thumb of Yellowstone Lake, near Snake River Junction, during most of the season to accommodate tourists entering from the south. At Thumb his branch store was maintained in a building formerly used as a lunch station by the hotel company. Mr. Hamilton has for nearly a year had in process of construction a fine new store building at Lake Outlet, on an entirely new site, on the lake shore. He anticipates having it finished in time so it can be used by the opening of next season. He also constructed a new filling station at Upper Geyser Basin, near his general store, but did not get the tank installed in time to operate it during the past season. A 5½-foot concrete sidewalk, about 250 feet in length, was constructed by Mr. Hamilton from his Upper Basin store to Old Faithful Inn.

Mr. Henry P. Brothers, of Salt Lake City, operated the Geyser Baths at Upper Geyser Basin during the season and gave satisfactory service. He reports that a total of 11,018 baths were furnished, of which 8,959 were furnished to tourists and 2,059 to park employees.

Meadames Pryor & Trischman operated their curio shop and ice-cream parlor at Mammoth Hot Springs in a very satisfactory manner. They also conducted weekly, picture shows and dances twice a week in the post exchange auditorium, which service was especially appreciated by park employees. They made some slight changes in the front of their store at the suggestion of the landscape architect, and gave the inside of the store a general renovating.

The Yellowstone Park Boat Co. operated small gasoline boats and rowboats at Lake Outlet when there was a demand for them for picnic and fishing excursions.

All of these public utilities rendered excellent service to the public, and complaints against them were rare. All enjoyed excellent patronage.

INFORMATION BUREAU.

Previous to this year there has been no settled place to secure information, the clerks handling as best they could such inquirers as came in. This year, however, a small office with photographs, a ground relief map, and a collection of wild flowers on the walls was established under the charge of the park naturalist. The office was further supplied with a few geological specimens for exhibition, and with maps, pamphlets, and circulars for free distribution and for sale. The result was an astonishing one. Ten thousand one hundred inquirers, or 12½ per cent of our total travel, visited the information bureau

and appeared very much pleased with the service rendered. About 9,000 general information circulars of Yellowstone National Park were given out, and also 1,500 circulars of the other national parks. Two thousand Glimpses of Our National Parks were distributed free; 979 pamphlets and 248 maps were sold, and 540 additional calls received for sale pamphlets that were out of print, and more than 1,000 calls for a pamphlet on flowers. In addition, much research was done to secure information and some answers sent out by mail.

A further service was the preparation of monthly bulletins on birds, animals, flowers, and geology, and the posting thereof in all public places in the park. About 35 sets were posted each month, and this led to a call for extra copies, and accordingly 776 sets were given out free. The August bulletin is quoted below:

DEPARTMENT OF THE INTERIOR,
NATIONAL PARK SERVICE,
YELLOWSTONE NATIONAL PARK,
Yellowstone Park, Wyo.

August notes on the flowers.

During early August summer is at its height on the park plateau and on the high mountains. But before the end of the month heavy frosts are apt to occur, and autumn begins on the high peaks and gradually creeps down from the heights to the park plateau, where most of the tourist routes lie. While the fields of blossoms on Mount Washburn and our other peaks are now wonderful to behold, they have not the frost-resisting capabilities of our earlier flowers, and the frosts soon cut them down. This year has been a remarkable one for flowers of all kinds, the blossoms are in great masses of color everywhere, and the blossoms themselves larger and far more beautiful than is usually the case.

Geraniums, asters, wild roses, and some lupines are still in bloom below 7,000 feet altitude. Here and there cedar berries and chokecherries are ripening. So, too, are the wild red raspberries and the service berries, but our friends of the bird and bear tribes do not leave many berries for human taste.

On the park plateau, between 7,000 and 8,000 feet levels, Indian paint brush, yarrow, fringed gentians, harebells, and lupines are at their height, and are chiefly responsible for the great masses of color in our meadows and forests. A few of our earlier flowers still persist, but most of them are over. Yellow columbines are still blooming in the damper forest glens. Monkshood, goldenrod, and fireweed are just coming into bloom. Strawberries, gooseberries, salmonberries, and service berries are ripening everywhere. The higher pine forests are matted beneath with masses of low huckleberry shrubs and the tiny red berries are ripening. Although different from the eastern huckleberry in size and color, they have the same taste and other properties. In other parts of the forests wintergreen and Kinnikinnick berries are ripening, especially toward the end of the month.

It is the high mountains that carry our glorious flower gardens of August. The hills of the lowest elevations are dry and turning brown, but the highest peaks and mountain meadows are a glorious mosaic of colors. Brilliant, scarlet paint brush, white phlox, deep blue forget-me-nots, buttercups, purple asters, and the ever-increasing lupines form a picture wonderful to behold, especially down the northern slopes of Mount Washburn. But toward the end of August the first frosts of autumn begin to blight the blossoms and to color the leaves of dog-bane, mountain ash, willow, and the higher quaking asp.

August notes on geology.

At Mammoth the big spring on Jupiter Terrace is discharging less water than usual, but Hymen Terrace is becoming more active again, and a number of new or formerly abandoned terraces are building up and the water discharging more actively than ever. The beautiful pink algaous coloring of the slowly drying Angel Terrace is peculiarly fine, while the growth of the algae itself is easily observed at Hymen Terrace.

At Norris the Constant Geyser has practically discontinued operations and its activity transferred to the Whirligig Geyser directly across the footpath. The Monarch and the Bathtub have not been playing at all. The Black Growler is regaining much of its power of 20 years ago.

At Fountain the two most important geysers are playing quite regularly, the Fountain having fine eruptions from its older crater about every 4 hours. The Great Fountain has still more wonderful displays every 8 to 12 hours.

At Upper Geyser Basin Old Faithful is maintaining its wonderful activity, with eruptions every 60 to 65 minutes and averaging about 63 minutes between displays. Occasionally an eruption is delayed and a few occur sooner than the regular time. The Daisy is playing quite regularly at 80 to 90 minutes and increasing in height a few feet each year over the previous year. The Grotto is playing frequently, but not developing any regularity as to intervals between eruptions or the duration of the eruptions. The Giant is playing every 6 to 12 days, the last eruption having occurred on July 27. The Giantess is playing at intervals of 7 days or more, the last eruption having occurred on July 28. The Beehive usually plays two or three times after the Giantess, eruptions being from 12 to 20 hours apart. A small geyser 10 feet east of the main cone plays for 20 minutes before an eruption. The Grand has become our most notable geyser; there is no foretelling the hour of eruption and it has no known indicator, but it plays once or twice a day and is very beautiful and powerful. It plays from 15 to 30 minutes, having from 5 to 15 distinct eruptions following each other at a minute's interval. The Castle has become irregular, with no discovered system to its play. Usually plays at least two or three times a week. The spurts thrown out 10 to 30 feet high at short intervals are not an indication of eruption.

August notes on the animals.

The show herd of 15 buffalo are on view at the corrals near Mammoth. So far, about 60 calves have made their appearance in the tame herd this year. The wild herd, too, seems to be increasing.

Mountain sheep are on the high mountains, but occasionally seen on Mount Washburn. Lambs are now 2 months old.

Elk are on the high mountains to get away from the flies. Not apt to be seen along the tourist routes, but short trips into the forest glades or up the mountains should disclose a few. A small bull is staying about Camp Roosevelt. The horns will be full grown about the middle of the month, but still covered with skin. The calves are 2 months old, and still spotted with round, white spots.

Deer might be seen in ones and twos at almost any point throughout the trip, particularly near West Thumb and the canyon. Horns are full grown, but still covered with skin. The fawns are 3 months old and still spotted with white.

Beaver are shy, but might be seen at almost any point in the evening but not in the daytime. In Willow Park, near the Yellowstone Bridge below Tower Falls, and on the beaver pond alongside road to Mammoth, 15 miles from Tower Falls, are the most likely places. Most of the beaver have abandoned their houses and dams until autumn and are now living in holes in river banks.

Coyotes are common almost everywhere, but the wolves and mountain lions are so rare as to be seldom seen.

Black, brown, and cinnamon bears are all the same species, just as we have black, yellow, and white cats. They are to be seen about the dumps near Old Faithful, lake, and canyon, and also near West Thumb and Tower Falls, and might appear almost anywhere. The cubs are now about 6 months old, having been born a month or more before the parents left their places of hibernation. No matter how friendly they seem, all bears are apt to become dangerous without warning. Leave 'em alone!

Grizzlies are comparatively rare, but might be seen about the dumps at lake and canyon after sunset. Not apt to appear in daytime.

August notes on the birds.

August is a very unsatisfactory month to study our birds. The season of song and bright plumage is over; most of the young birds have been cared for and are out of the nest; the old birds are moulting and consequently most morose; and, finally, it is so warm that the bulk of the birds remain all day in cool, shady retreats.

Fall migration began with the arrival of the first willet on July 20. Soon the other shore birds and waders will come down from their northern homes, and the swallows will leave us during the last week of the month.

The presence of young birds will prove very confusing in the effort to identify our birds. Most of the young have left the nest and only a few of the warblers, the swallows, the nighthawks, and mountaineers of the robin, bluebird, and junco species are still nesting. At the osprey nest on Eagle Nest Rock the young are almost grown. At Inspiration and Artists Points and the Grand View at the canyon heavy hailstorms destroyed the nests early, and it is doubtful if the birds will nest again this year. The osprey nest along the road to the east entrance had better luck and escaped the hail.

A pair of bald eagles have recently established a nest on a dead lodgepole pine on the eastern bank of Yellowstone River a mile below the road to the east entrance. The eaglets might be seen occasionally when they appear on the edge of the nest.

It has been a favorable year for the broods of geese and ducks. Large numbers of Canada geese are on Grebe Lake and at the south end of the Yellowstone Lake. Mallards and blue-wing teal are in numbers on the marshes south of Yellowstone Lake. White pelicans and gulls are nesting on Molly Island, and this month the young pelicans and gulls begin to leave their nests.

M. P. SKINNER, *Park Naturalist.*

Approved for publication August 1, 1920.

HORACE M. ALBRIGHT, *Superintendent.*

A further most valuable feature of the information service, and one which was highly appreciated by tourists, was the giving of free half-hour talks or lectures by Park Ranger Isabel Basset Wasson three times daily—at 4 p. m. at Mammoth Camp; at 7.30 p. m. on the porch of Mammoth Hotel; and at 9 p. m. at the public automobile camp at Mammoth Hot Springs at a camp-fire gathering. The title of the lecture usually given was "How the Yellowstone Came to Be." This was a short discussion of the geological formation of the park expressed in nontechnical language. The lecture was sometimes varied, however, by giving other talks on the history of the park, the care of its wild life, and other subjects of interest to the traveling public. Many favorable comments on the value of these talks were heard daily from tourists.

ROADS OF THE PARK—PAVEMENT A NECESSITY.

Last year I commented at length upon the need of adopting a program for permanently surfacing the roads of Yellowstone Park, or at least those that are hardest and costliest to maintain. This discussion appears on pages 164 and 165 of the 1919 annual report, and I call attention now to the fact that everything said in that report is more important than ever as a result of another year's operations.

ROAD MAINTENANCE AND IMPROVEMENT.

During the past season the roads have been in excellent condition, but were kept so only by the most painstaking efforts on the part of the officers of the park and the road foremen. Hundreds of favorable comments on the smooth condition of the highways and the effective sprinkling were made at the central office and at ranger stations by pleased tourists.

Much of the success of this season in road maintenance is to be credited to the employment of Gen. Chittenden's section-crew idea, something that had been abandoned for many years. This plan involved the use of section crews every few miles apart on all main highways, these crews being charged with the filling of chuck holes and ruts and the installation of culverts and other such repairs. Equipped only with a gravel wagon and a team, each crew sought simply to keep its own section smooth and thoroughly pleasant for driving. The plan worked so well this year that it will be utilized next season on a much larger scale.

The very late spring kept the roads closed until well into May, and grave fears were entertained that it would be impossible to open the park in time. The early snowfall in October had stopped much construction work in the upper park. This work had to be finished, the hotels, camps, and stores had to be rationed, and roads and bridges had to be repaired before June 30.

THE SNOWPLOW.

Faced with this discouraging accumulation of snow and a desperate necessity for overcoming it, a plan had to be developed for clearing the roads. The result was the construction by our master mechanic of an immense snowplow, which was made of sheets of boiler steel one-fourth inch thick, and fastened to a 75-horsepower Holt caterpillar. With this plow the roads from Golden Gate to Lake Outlet by way of Grand Canyon, a distance of over 40 miles, were cleared of snow, leaving a roadway for motor vehicles 11 feet wide.

The plow left headquarters May 12, and arrived at the lake on May 28. Later, about the middle of June, this power plow opened Dunraven Pass.

All of the main loop roads were ready for traffic on June 20, the first day of the season, except the Dunraven Pass road. This, however, was opened on June 28, and on July 1 all cars were permitted to pass over the road. Only five days thereafter were the yellow cars of the Yellowstone Park Transportation Co. routed by way of Norris.

The approach roads of the park were opened on time, with the exception of the south road, which was opened about June 22. Sylvan Pass was opened on June 17, the snow being shoveled out by crews of men working from both sides, the Cody Club paying for one crew, a notable cooperative effort that the service tremendously appreciated.

Advancing now to a brief mention of work performed on the roads, the following is submitted as a mere sketch of our road maintenance activities:

The main belt line.—To care for this loop system and its crossroad from Norris Junction to Canyon Junction, sprinkling and maintenance (section) crews were stationed at Mammoth Hot Springs, Beaver Lake, Gibbon Meadows, Madison Junction, Excelsior Geyser Basin, Spring Creek, West Thumb, Lake Outlet, Trout Creek, Grand Canyon, and Virginia Meadows. These crews sprinkled the roads, except several miles on the Continental Divide and between Arnica Creek and the Natural Bridge on the Thumb Lake Road. The men stationed with each of these crews, and charged with filling up ruts, etc., worked with gravel wagons and did very effective work in keeping the highways smooth.

Between Canyon Junction and Tower Falls Junction the construction crew in Dunraven Pass did considerable maintenance work on the main road, as well as on the Mount Washburn Road. Likewise, a large crew organized for heavy road repairs also did light maintenance work between Tower Falls Junction and the 3-mile post east of Mammoth Hot Springs.

The construction crew in Dunraven Pass, with steam shovel and air-compressor outfit, as well as graders and gravel wagons, continued the widening of the road and making of fills. Three large fills and one small one were completed. 1½ miles of road were widened, one 16-inch galvanized-iron culvert and one 24-inch galvanized-iron culvert were installed, and several old culverts were temporarily repaired. During the summer the grader crew made three trips over the Mount Washburn Road.

A graveling crew was located part of the summer at Mud Volcano and the remainder of the season at Lake. This crew placed 300 cubic yards of gravel on the Lake-Canyon Road, but mostly on that section south of Mud Volcano.

At Lake this crew widened the fill just west of the Lake Hotel, 250 cubic yards being added to the fill. It also completed the grading of the new road along the lake shore, past Hamilton's new store, and graveled this new section. A steam roller is now completing this job.

This crew also did heavy grader and maintenance work on 5 miles of the road west of Lake Junction toward Thumb, and from Lake to Trout Creek, and lighter work was performed on the east approach road 5 miles beyond Lake Junction.

A large crew was on the Tower Junction-Mammoth Road from about August 1 to September 12. This crew finished the Geode Creek fill and placed a 2-foot rock cap on the fill, in addition to carefully ditching it as a protection against becoming soft.

The crew also improved the approaches to Camp Roosevelt, later returning to the 6-mile post east of Mammoth Hot Springs. It made general repairs to the road for several miles west and east of that point. Near the Beaver Dam the road was raised and 400 linear feet of the highway was graveled near Blacktail Deer Creek. Nine galvanized-iron culverts were installed between the 4 and 8 mile posts on this road.

This crew is now building a new road to Mammoth Camp from the main Mammoth-Norris Road.

On the west side of the loop system during July the power grader outfit, with a gasoline roller, repaired the Mammoth-Norris Road from the 7-mile bridge over the Gardiner River to the 18-mile post from Mammoth. It also improved the road to Madison Junction from Norris.

Later in the season this outfit was moved to the Canyon, where it repaired the main road around the Canyon Hotel and out as far as the garage.

The North approach road.—Considerable graveling was done on the north approach road from Gardiner, and protection was given to this important highway by placing log cribs in the Gardiner River to prevent washing by flood waters. Grader work on the road was also performed from time to time.

The west approach road.—This road was maintained by the crew at Madison Junction. During August the power outfit, equipped with grader, scarifier, and gas roller, tore up, reshaped, and rolled 6½ miles of the oil macadam road east of the Riverside ranger station. Later in the summer the oil macadam road between this station and the west entrance was patched wherever holes had been worn in the surface.

The east approach road.—This road was maintained and repaired by a crew stationed at Cub Creek, 12 miles from Lake Junction, and a small cut of 400 cubic yards was made to eliminate a sharp curve. The material from the cut was used to raise the road. The crew also drained the road and repaired culverts between Sylvan Pass and Pahaska. Seven galvanized-iron culverts were installed.

The south approach road.—This road was repaired and maintained throughout the summer. First a small crew made emergency repairs, then a large crew did considerable heavy maintenance work, grading, draining, repairing culverts, removing fallen trees, etc. From time to time a second grader crew went over the road.

The east approach road (in the Shoshone Forest).—In April, under a deficiency appropriation of \$3,000, a log crib was built to protect the big Elk Fork Bridge. The crib was built of logs, with log floor and rock fill. It is 200 feet long, 5 feet high, and 7 feet wide. This construction crew also cleared the channel under the bridge of driftwood, and the abutments of the old bridge were floated away.

In May and June this crew graded and repaired the forest road up to the park boundary, then assisted in clearing Sylvan Pass of snow.

The south approach road (in the Teton Forest).—This road was lightly graded and general repairs were made as far as Pacific Creek. Here it prepared to build log cribs for the protection of the road and bridges, but had to be recalled to repair the road near Arizona Creek, and on account of shortage of funds had to be ordered to headquarters before any crib work could be performed.

The Cooke City Road.—One mile of this road between Tower Falls Junction and the Yellowstone River was rebuilt. The grades were reduced, three galvanized-iron culverts were installed, and the road was widened. The road was graded as far as the Lamar River bridge. Part of the expense of this improvement was borne by Cooke City operators.

Bridges.—The steel bridge over the Yellowstone, known as the Baronett bridge, and the Lamar River bridge were repaired and strengthened during the season.

The Sylvan Pass under-pass bridge was completed and made ready for its fill on August 17, 1920. This was built by contract under the 1919 appropriation.

TRAIL CONSTRUCTION AND REPAIRS.

Five small crews with pack trains were employed most of the summer building new trails, clearing out and repairing old ones, and building and repairing snowshoe cabins. Twenty-seven and one-half miles of new trails were opened up, namely, 3½ miles to connect Lone Star Geyser with Upper Geyser Basin via the west side of the Firehole River; 17 miles from the Cody Road near Turbid Lake to the east boundary via Jones Pass; and 7 miles to connect the Upper Lamar Trail at the mouth of Cold Creek with a new snowshoe cabin and lookout point near Frost Lake. The mileage of old trails cut out and repaired was 524½. The full list of trails in the park, showing mileage of new ones built and old trails repaired, is shown below.

TRAIL SYSTEM.

Twenty-seven and one-half miles of new trails were constructed during the season of 1920, and 524½ miles of old trails were cleared out and repaired. Of the 620 miles of trails in the park as listed below, 366 miles were used by tourists, and the number of tourists making use of them is estimated at 900 to 1,000.

List of trails in Yellowstone Park.

Name of trail.	Length, in miles.	Miles built, 1920.	Miles cleared out and repaired, 1920.	Name of trail.	Length, in miles.	Miles built, 1920.	Miles cleared out and repaired, 1920.
Sportsman Lake.....	20		20	Canyon Lake ¹	14		14
Sepulchre Mountain ¹	7		7	Lamar ¹	48		48
Fawn Pass.....	24		24	Grebe Lake ¹	9		4
Snow Pass ¹	5		5	Storm Peak ¹	21		21
Riverside.....	26		26	Washburn ¹	20		20
Crystal Spring ¹	2		2	Mount Washburn ¹	7		
Lake of the Woods ¹	8		8	Specimen Ridge.....	12		
Mesa ¹	8		8	Amethyst Mountain.....	7		
Madison Plateau.....	15		15	Fossil Forest ¹	1		
Fairy Falls.....	6		6	Crystal Creek.....	1		
Little Firehole.....	11		11	Turkeypen ¹	7		
Grizzly Lake.....	2			Knowles ¹	8		
Summit Lake.....	16		16	Hellroaring.....	15		15
Mallard Lake ¹	8		8	Crevice.....	5		
Mary Mountain ¹	25		25	Hellroaring-Lamar.....	12		12
Lone Star ¹	34	34		Slough Creek ¹	12		
Norris Pass ¹	14		14	Steamboat Point ¹	7		7
Sheridan ¹	14		14	Frost Lake ¹	7	7	
Shoshone ¹	15		15	Heart Lake ¹	8		8
West boundary.....	60		60	Lake Shore ¹	11		11
Snake-Bechler.....	22		22	Lower Falls ¹	1		
South Boundary.....	33		33	Uncle Tom ¹	1		
Upper Yellowstone ¹	35		35	Seven-mile Fishery ¹	3		8
Jones Pass ¹	17	17					

¹ Used by tourists.

BUILDINGS.

The large wooden stable south of the stone garage was remodeled for the storage of vehicles and road equipment. Stalls were removed and a row of double sliding doors, 15 in number, placed clear across the west side to provide ease of access. Sixty vehicles of average size can be stored here.

Part of a frame building formerly used as a hay shed was altered by tearing out the floor, making double the walls and partitions, and providing plenty of doors and ventilation, for use as a general ice house, and the old unsightly ice houses near Mammoth Camp were torn down. One hundred and five linear feet of this building, which is 20 feet wide inside, was so altered and two partitions provided, making three compartments for use of the Government, the hotel company, and the camps company, respectively. The two companies paid the expenses of remodeling this building. The total capacity is 750 tons of ice. The balance of this building is still used for storing hay.

The cottage occupied by Chief Ranger McBride at headquarters was renovated and water from the mains, toilet, and bathroom installed.

A small wooden building near the stone garage was remodeled into an excellent paint shop. The changes were not many, requiring new floors in part and new double doors to permit the entrance of large vehicles to be painted.

New water system and electric lights were installed in the log cabin 1 mile south from headquarters used by the ranger in charge of the show herd of buffalo.

SNOWSHOE CABINS.

Several new one-room, rough log cabins, 12 by 16 feet in size, were built as stopping places for park rangers making patrols in winter on snowshoes, namely, one at Frost Lake near the east boundary, another at Harebell Creek on the south boundary, another to replace an old one at Cascade Creek on the south boundary, and a fourth one in the northeast corner of the park near the Cooke City entrance. Late last fall a new cabin was built at Aster Creek on the Snake River Road to replace the old one which was badly located near Lewis Lake. This cabin was 14 by 16 feet in size, with shingled roof, and 1-inch board floor. Another cabin was built late last fall at Park Point, to replace the old one there. This cabin also has a shingled roof. A new cabin was built recently on Thoroughfare Creek in the southeast corner, designed to house two rangers who will be stationed there all winter. This cabin is built near the old cabin, which can be utilized as a stable, and is 18 by 30 feet in size, with two rooms.

All of these cabins except the ones at Aster Creek and Park Point have roofs of rubberoid, laid over hewed poles and covered about 6 inches deep with earth. The floors are of poles flattened on three sides, and the doors and window shutters are made of 2-inch plank to provide protection from bears. The walls are of peeled logs, well chinked with mud.

The cabins at Sportsman Lake and Buffalo Lake were repaired by putting on new rubberoid roof and furnishing floors of squared poles and heavy plank shutters and doors, and those at Grayling and West Line, south of Riverside, were repaired in the same manner, except that the roof board under the rubberoid and the floors are of 1-inch boards which were reclaimed from old buildings near the west entrance. Nineteen snowshoe cabins were rationed and otherwise supplied for winter use.

AUTOMOBILE CAMPS.

The development of a system of much-needed camps for the use of the thousands of tourists driving their own automobiles through the park was begun during the past season, and excellent progress was made. The most essential things in developing these camps are a good supply of pure drinking water and adequate sanitary toilet facilities. Realizing the importance of these camps, due to rapidly increasing travel, the work of developing them at some of the main points was begun early in June, just as soon as the roads were open.

On June 4 we began the work at Canyon, and by the end of the month the water system was nearly completed. It consisted of a pipe line bringing water from the hotel company's water system at Canyon Hotel to the site of the new camp, which is on the knoll near Canyon Junction, formerly the site of the Wylie Permanent Camp. About 5,000 feet of 1½-inch galvanized-iron pipe was laid a foot underground, from the hotel to the camp site, and at Canyon Junction a branch line was taken off to supply the Canyon ranger station and the general store. The branch line, and the distribution of the water to 11 faucets which were placed at convenient intervals in the public camp, required the laying of 1,400 feet of 1-inch and 700 feet of three-fourths-inch galvanized-iron pipe. Sanitary earth closets to the number of six were provided in this camp. Signs necessary for the guidance of occupants of the camp were made and put in place. The old buildings left by the Wylie Co. when the camp site was abandoned were torn down, and the logs, together with dead and fallen timber, cleared from the camp site, saved for wood for the campers. This camp was filled with tourists as soon as opened, as it replaced a badly located and poorly equipped site opposite the ranger station.

Similar accommodations were provided at a new camp located at Upper Geyser Basin, in the thick timber on the opposite side of the road from Old Faithful. Here, however, the work of clearing the site was considerable, as there was much fallen timber to clear away, and green timber had to be cut to provide roadways to and through the camp. This camp is ideally located on level, sandy soil, close to but entirely screened by trees from the road; convenient to the objects of interest, stores, etc. Here also the water was a serious problem, as there is no adequate supply of pure water close by. As a temporary expedient a pipe line was connected with the hotel company's system, and the much-needed camp was opened to tourists early in August, abandoning the old camp just below the camps company's site on Firehole River, which was badly located for the large numbers of people who desire to camp there.

The question of an adequate supply of pure running water for this most important camp was solved by building a low concrete dam, about 15 feet long, across a small stream of clear, pure water, located about a mile from Old Faithful Geyser in a north-easterly direction. This formed a small reservoir, from which the water was piped to a 700-gallon concrete settling basin through a 3-inch main. There is a fall of about 100 feet from the settling basin to the camp. From the settling basin the water is run for 3,900 feet through a 2½-inch galvanized-iron pipe, when the main pipe branches into two 1½-inch mains, one 1,800 feet long leading to the public camp, and the other, 1,500 feet long, to the camps company's Old Faithful Camp. The camps company bore its proportionate share of the total expense of the work.

The public camp developed last year at Mammoth Hot Springs near the power house proved the most popular of the two, and therefore the one at the old barns was aban-

done. Improvements were made to the lower camp by increasing the size of the water pipe which supplied it, and adding laterals and more faucets to the system, distributing them over a larger area. The water system as now developed consists of 500 feet of 1-inch main taken from the headquarters water system at the power plant, extended farther by 800 feet of three-quarter-inch main, with 910 feet of three-quarter-inch laterals. Additional toilets were also provided at this site, and garbage cans, which were emptied daily, placed at convenient intervals.

No work has been accomplished for years that is of more importance to the public than the improvement of these camps. Providing plenty of pure running water is especially important. The number of tourists who make their own camps has become so great that the main camps at Mammoth, Upper Basin, Lake Outlet, and Grand Canyon are crowded throughout the season, and it requires the services of one to two men and a team constantly to keep them cleaned up and supplied with wood. The improvement and development of the camp at Lake Outlet, and of several of the minor camps which are used extensively, is important, and this work will be continued as rapidly as funds will permit.

WALKS IN UPPER GEYSER BASIN.

For many years tourists, in order to observe many of the springs in Upper Geyser Basin, Norris Geyser Basin, and Excelsior or Midway Geyser Basin, have had to walk in water. Board walks were constructed many years ago in Norris Basin, but no provision was made for bettering conditions in the other basins. In an effort to make things more comfortable for pedestrians in the Black Sand Basin, where several beautiful pools are located, we built this year 1,800 feet of walks reaching all of the principal pools. These walks were built as follows:

Two concrete curbs 6 inches wide were built 6 feet apart along the routes laid out. These curbs were used as retaining walls for formation material of the same texture as that composing Black Sand Basin itself.

From the standpoint of comfort to tourists these walks were an immediate success, but the concrete curbs are a little more conspicuous than we expected them to be, and something may yet have to be done to harmonize them more closely with the surface of the basin.

Two small footbridges of logs were constructed, one across Iron Creek to connect with the new walks, and another near Old Faithful Geyser. As soon as the season closed paths through the main Upper Geyser Basin were in course of improvement. Three hundred linear feet of trails were improved and 325 linear feet of walks similar to those constructed in Upper Basin were built over small watercourses.

TELEPHONE AND TELEGRAPH LINES.

On the date of my last annual report we were maintaining 269 miles of grounded telephone and telegraph lines in the park, which included 22 miles of line between Snake River and Beecher stations which was seldom in use, as it was impracticable to keep it in a serviceable condition on account of the rough country which it traversed. This line was taken down recently, and therefore the total mileage of lines in the park is now 247.

Heretofore the headquarters-Norris line consisted of two grounded circuits on the same poles, splitting at Norris Junction so as to serve both sides of the park. The induction between these two lines has always been so great as to cause much inconvenience, and often it was so bad that conversation could be carried on over but one of them at a time. To avoid this two additional wires were strung on crossarms on the same poles, providing two metallic circuits to take the place of the two grounded ones from Mammoth to Norris, improving the service wonderfully.

Another important improvement in the same line was made by running separate wires into Mammoth Camp from our switchboard instead of having the camps company's attachment made from the headquarters-Norris line.

During June and July heavy repair work was required on all park lines to repair damage done during the long winter and put the lines in shape for good summer service. The Dunraven Pass line, which runs from Canyon to Tower Falls ranger station, which has not been kept up since 1916, when it was built for the purpose of checking automobiles, was thoroughly repaired, requiring the resetting of nearly all the poles for the whole distance of about 20 miles. This gives us two lines to Canyon station, one via Norris and the other via Tower Falls. Lake Junction to Sylvan Pass, 16 poles had to be reset, and about a mile of this line at Jackson Grade was changed so as to prevent further trouble from poles washing out during high water. Thirteen miles of the line between headquarters and Tower Falls station was practically rebuilt.

Innumerable small electric storms throughout the park during July and August caused many cases of slight damage to the lines by burning out of fuses, the burning out of two pairs of wires in the cable leading to the switchboard, etc., requiring constant attention of two linemen to keep the lines working satisfactorily. On the night of August 7 we had a heavy windstorm in the Gibbon Canyon, which blew down considerable timber and broke the line eight times. Repairs to this line were not completed until about 8.30 p. m. on August 9, on account of the inaccessible country through which this line passes, it being necessary to cover the territory on foot.

CULTIVATION OF LAND.

The 454-acre field at the northern entrance was reseeded to timothy and clover last spring, and was kept irrigated during the summer. Parts of it have a fair stand of grass, but the crops were not heavy enough to pay the expense of cutting it for hay, and it was left on the stalk to be eaten later by the elk and other wild animals. The field is still foul from weeds in places.

No work in the line of cultivation of new meadows was done. The old meadows at Lamar River were kept irrigated, and the meadows on Slough Creek were irrigated and cleared of brush, so that the hay could be harvested more easily. Both meadows yielded excellent crops of hay.

There are vast natural meadows on Slough Creek, and they can be made to yield hay that can be utilized for feeding buffalo, elk, and other animals more economically than can be furnished by cultivating and seeding meadows on the Lamar River, provided the

winter conditions as to snow and cold will permit us to hold the animals there in winter to be fed.

In my recommendations at the end of this report I advocate the expenditure of necessary funds in developing these hay lands.

ICE.

During December and January 232 tons of excellent ice were harvested, hauled about three-fourths of a mile to our new ice house, and securely packed for summer use. Most of the work was done by regular employees, and the cost, including their wages, was \$1.57 per ton.

SIGNS.

A very considerable amount of work was accomplished during the year in the erection of signs in different sections of the park. New milepost signs were placed between Lake Junction and Canyon Junction, between Canyon Junction and Tower Falls Junction, and between Tower Falls Junction and Mammoth Hot Springs. New signs designating the public automobile camps and ranger stations were manufactured in the park, and proved to be very effective when installed. Large signs were also placed at each entrance, as well as at every road junction.

Several hundred small direction signs for the public automobile camps, the geyser basins, and miscellaneous unmarked points of interest were made in the park and installed by the master painter, who has been given full charge of all sign work throughout the park, not only of the Government but also of the various park utilities. An effort is being made to harmonize and unify all park signs.

The colors used in the manufacture of all signs are green and white, with red for danger warnings.

WATER SUPPLY AND POWER PLANT.

Park headquarters at Mammoth Hot Springs is provided with an adequate supply of pure mountain water from streams 7 miles south, brought through a substantial system of pipe lines, reservoirs, and mains. This system furnishes water to all Government buildings at headquarters; to the public utilities whose headquarters are located here, including the hotel company, camps company, transportation company, and store, curio shop, and picture shop. A description of this system will be found on page 167 of the annual report for 1919.

During the past season a pipe was connected with the system to furnish pure water for use of travelers using the public automobile camp near our power house, and half a dozen faucets were placed at convenient intervals throughout the grounds.

The hydroelectric power plant, which was also described in detail on page 167 of the 1919 annual report, is supplied with water for power from the same system.

Extensions of the lighting system were made during the season as follows: A pole line was constructed and a new street lighting circuit 1,200 feet long was established, providing street lights from the circuit at the south end of the headquarters grounds, near Liberty Cap, up the hill past the employees' quarters, and on to Mammoth Camp. Another line was constructed from a point on the south side of Capitol Hill, south for 3,600 feet to the cabin used by the ranger who is in charge of the show herd of tame buffalo.

The northern entrance checking station was also connected up with the Gardner City electric-lighting system, providing light for registering automobiles after night, at the entrance arch. This took a line 400 feet long.

Most of the outside wire required for all of the above-named extensions was secured by reclaiming old wire that was formerly used to connect up the Gardner Canyon Slide with the power plant, where it was no longer needed.

The total production of the power plant for the fiscal year 1920 was 148,260 kilowatt hours, which was disposed of as follows:

Electric current sold, 18,184 kilowatt hours.

Consumed by Government buildings, shops, street lighting, and lines, 130,076 kilowatt hours.

The peak load for the year was 56 kilowatts.

The cost of the electric system for the fiscal year 1920, as shown by the cost report, was \$6,189.87. The actual cost to the Government to produce current was 4½ cents per kilowatt hour. The electric current was sold at 5 cents a kilowatt hour, the total of 18,184 kilowatt hours sold bringing in a revenue of \$909.20.

IRRIGATION SCHEMES.

There are under discussion in the States of Montana and Idaho schemes more or less speculative in their nature which contemplate the utilization of several of the most beautiful sections of Yellowstone Lake for storage reservoirs.

The Montana project contemplates the erection of a dam at the outlet of Lake Yellowstone, this dam to be used for the storage of water to be used in irrigating lands in southern and eastern Montana. The promoters of this project first asserted that they wanted to construct a dam that would store water 8 feet above low-water mark, but now they assert they want to construct a 6-foot dam.

There are several Idaho projects. One contemplates the use of Lake Yellowstone, this project being similar to the Montana scheme, except that the water is to be taken into the Snake River by means of tunnels through the Continental Divide. Another Idaho plan contemplates the erection of dams at the outlets of Lewis and Shoshone Lakes and the raising of these lakes to a height that would bring about the destruction of numerous areas of timber.

The most actively promoted Idaho project, however, is the one that involves the erection of dams in what is called the Falls River Basin. These structures would store the waters of Becher River, Falls River, Mountain Ash Creek, and other streams, and would flood between 8,000 and 10,000 acres of fine meadow and timber land lying

at the base of scenic cliffs and plateaus, within which there are more waterfalls than there are in all of the remainder of the park combined. This is the project that has already been presented to Congress and received the approval of the Senate.

None of these projects should be favorably considered under any circumstances, because any one of them will result in the desecration of the park to a greater or less extent. More important than this, however, is the fact that should approval be given to the least harmful of the plans, namely, the one advocated by Montana promoters, a precedent would be established that would mean the ultimate ruination of the park.

TRIP TO UPPER YELLOWSTONE AND BECHLER RIVER REGION.

For the purpose of determining the relation of several proposed irrigation schemes to the Upper Yellowstone region and the southwest corner of the park, known as the Falls River Basin, I left headquarters on September 29 and made an extensive trip throughout the southern part of the park. I first visited the Yellowstone River Valley beyond the southeast arm of Yellowstone Lake, a region inhabited by the park's largest moose herds, and went up the river as far as Bridger Lake, inspecting en route the new Upper Yellowstone ranger station, which has just been erected.

I then moved westward up Lynx Creek; thence along the south boundary to Fox Creek; thence over Big Game Ridge and up the Snake River Trail nearly to Heart Lake. The Snake River Valley was also traversed to the Snake River ranger station, and from that point the south line of the park was followed to Grassy Lake Creek. Leaving the boundary at that point, we followed the old Marysville Road across the Falls River and Bechler River valleys to the Bechler River ranger station in the southwest corner. I spent two days examining the basins of Falls River, Mountain Ash Creek, Bechler River, and Boundary Creek, as well as reservoir sites south of the park. After completing this work, a trip was made up the Bechler River to its headwaters; thence to Shoshone Lake and its geyser basin; thence to Heart Lake via Witch Creek, returning to the road at Lewis Lake.

This trip took me through a wonderful mountain region, much of which is visited by only a few hundred people each year, and the rest of which is almost unknown to any but rangers. Practically all of this territory was covered by Mr. William C. Gregg, of Hackensack, N. J., whose explorations and reports are mentioned herein in other connections.

FISH PLANTING.

The total collection of eggs of the black-spotted or native trout by the United States fish hatchery at Yellowstone Lake Outlet was 6,512,000, of which 5,692,400 were collected from Yellowstone Lake and tributaries, and 829,600 from Fish Lake, near Soda Butte station.

Mr. W. T. Thompson, superintendent of the United States fish hatchery, at Bozeman, Mont., who also operates the park hatchery, states that the quality of the eggs was very good.

Distribution.—Of the eggs collected, 1,951,300 were hatched at the park hatchery and planted back in small streams around Yellowstone Lake and in other waters in the park. The balance were shipped out and used as follows:

Shipped to Leadville, Colo., hatchery and planted in Colorado and adjacent waters.....	1,000,000
(The Leadville hatchery furnished part of the men engaged in making the collection in the park.)	
Given to Department of Naval Service, Canada, in exchange for salmon eggs...	200,000
Sent to Glacier Park hatchery.....	243,000
Sent to Bozeman hatchery and distributed from there.....	2,417,000
Planted in Yellowstone Park.....	1,951,300
Total.....	5,811,300

From these statistics it is evident that of 6,512,000 fish eggs collected in the park but 5,811,300 were distributed, a loss in hatching of 700,700, or nearly 11 per cent. Another considerable loss occurred in transportation from hatchery to stream, especially in the plants that necessarily had to be made with pack train, varying, according to distance and care taken, from 1 to 20 per cent.

Mr. Thompson also furnished eastern brook and rainbow trout for restocking streams in the park. The detailed list of fish planted in the park during the past season follows:

Tables of fish planted, 1920 season.

Date.	Waters.	Number.
<i>Eastern brook trout.</i>		
June 9.....	Glen Creek.....	10,000
	Obsidian Creek.....	10,000
July 17.....	Gibbon River, at Virginia Meadows.....	8,000
August 21.....	Nez Perce Creek, in Lower Geyser Basin.....	5,000
	Upper Firehole River, near Lone Star Geyser.....	5,000
		<u>38,000</u>
<i>Rainbow trout.</i>		
August 27.....	Gibbon River, in Gibbon Meadows.....	40,000

Table of fish planted, 1920 season—Continued.

Date.	Waters.	Number.
<i>Black spotted trout.</i>		
August.....	Bear Creek, in vicinity of East Road ^{1 2}	4,000
	Cub Creek, in vicinity of East Road ²	3,000
	Tributary to Sylvan Lake (east of Lake).....	6,000
	Lake Eleanor.....	4,500
	Middle Creek, 3-mile post to ranger station.....	30,000
	Crow Creek, near park boundary ²	5,000
	Delacy Creek, in vicinity of road.....	24,000
	Moose Creek, about 3½ miles from outlet ^{1 2}	24,000
	In tributary stream, outlet of Shoshone Lake (near outlet) ²	20,000
	Aster Creek, in vicinity of 12-mile post, West Thumb.....	20,000
	Tributary streams of Lewis River, near 9-mile post, West Thumb.....	30,000
	Crawfish Creek, west of road and above falls ¹	12,000
	Beula Lake ^{1 2}	7,000
	Falls River, near forks, vicinity Beula Lake ^{1 2}	14,000
	Falls River, near Cascade Creek and vicinity of Snowshoe cabin ¹	14,000
	Falls River, north of 3 and 4 mile posts and east of Terrace Falls ¹	30,000
	Falls River, in vicinity of 2-mile post west (Calfee Creek) ^{1 2}	15,000
	Cascade Creek, tributary to Falls River near 2-mile post ¹	30,000
	Proposition Creek, north of Birch Hills ²	10,000
	Mountain Ash Creek, vicinity of Union Falls ²	20,000
	Tributary to Falls River, near Bechler River ²	7,000
	Boundary Creek, about 2½ miles from outlet ²	14,000
	Boundary Creek, north of Falls ²	14,000
	Tributary to Robinson Creek, vicinity of 13-mile post, west boundary ²	7,000
	Slough Creek, above rapids.....	50,400
	Lamar River, above Buffalo Farm.....	30,000
	Soda Butte Creek, near northeast entrance.....	87,000
	Cache Creek ²	63,000
	Buffalo Creek, near park line ²	63,000
September 2.....	Tower Creek ²	76,000
September 3.....	Helroaring Creek ²	52,500
September 4.....	Slough Creek.....	105,000
September 11.....	Sedge Creek.....	52,000
	Bear Creek.....	48,000
September 13.....	Extreme headwaters of Bechler River ^{1 2}	84,700
<i>Planted by United States Bureau of Fisheries.</i>		
August.....	Pelican Creek.....	15,000
	Hatchery Creek.....	10,000
	Clear Creek.....	25,000
	Hatchery Creek.....	10,000
	Bridge Creek.....	20,000
	Hatchery Creek.....	5,000
	Pelican Creek.....	42,000
	Hatchery Creek.....	15,000
	One-Mile Creek.....	10,000
	Hatchery Creek.....	25,000
	Fiat Mountain Arm.....	60,000
	Clear Creek.....	46,200
	Chipmunk-Grouse.....	72,000
September.....	Columbine Creek.....	130,000
	Cub Creek.....	180,000
	Clear Creek.....	100,000
	Thumb.....	110,000
	Total.....	1,951,300

¹ Waters previously barren.² Fish had to be transported with pack train.

As will be noted, 234,700 of the black-spotted trout planted were placed in streams previously barren, and 19 of the plants made, with a total of 503,200 fish, were placed in streams so remote from the road that they had to be transported part of the way by pack train.

Transportation for the fish planted was furnished by truck and pack train by the National Park Service, except for a few loads taken with truck from Lake Outlet to Slough Creek and Lamar River by the Yellowstone Park Camps Co., the 875,200 planted by the United States Bureau of Fisheries in the small streams around the lake, and one lot of 84,700 planted in the very headwaters of Bechler River on September 13. This lot was handled from Lone Star Geyser to destination with a pack train furnished by Mr. Wm. C. Gregg, of Hackensack, N. J., who explored the southwest corner and Bechler River country very thoroughly during the past summer, and who takes a very strong personal interest in its development. The handling of this large number of fish with pack train was done principally by our permanent ranger force, and the men who did the work are deserving of special credit, as they usually had to work very late at night to get the fish to their destination without delay and save excessive losses. Every plant made was apparently successful, and the loss was relatively small.

While the number of eggs of black-spotted trout taken was slightly less than taken during the season of 1919, the season's work was much more of a success so far as the interests of Yellowstone Park are concerned, as the numbers used for restocking in the park itself were about 83½ per cent of the number of eggs hatched, while but about 9 per cent were replanted in 1919.

On September 25, Mr. Ernest Shaw, supervisor of the Absaroka National Forest, planted 5,000 black-spotted (native) trout fry in a small lake called "Hidden Lake" located about a mile north of the park line near where it is crossed by Buffalo Creek. This lake is sometimes connected with Buffalo Creek during periods of high water, but Mr. Shaw thought the black-spotted fry planted in Buffalo Creek near the park line might not find their way into it, and these waters were previously barren. Mr. Shaw transported the fry through the park by pack train from Lamar Bridge.

FISHING BY TOURISTS.

The large majority of tourists who visit the park are either not at all interested in fishing or do not have sufficient time at their disposal to do any fishing. Of those who do fish, by far the greater majority come from that class of tourists who are making camping trips through the park, and the most of their fishing is done in streams close to the main road, or at the Fishing Bridge near Lake Junction, where the fishing is easy and most everyone is more or less successful. Toward the end of the season, however, the trout are not so plentiful at the bridge, and many are disappointed. There are so many fishing in the streams close to the road that the fish are either frightened away or two well educated to take bait or a fly, and not a very great many are rewarded with big catches in the streams that are readily accessible from the automobile roads. To the comparatively small number of tourists who had the time and inclination to make trips some miles from the main roadways for the purpose of fishing, success in bagging the limit was the usual thing.

By a policy of increased planting in all the streams that are easily reached by everyone, it is hoped that the fishing may be improved so that all may enjoy success.

A 20-pound Mackinaw trout was caught with hook and line in Snake River, not far from the south entrance, on September 21, 1920.

WILD ANIMALS.

At the time of closing my last year's report the outlook for the wild animals, and the elk especially, was very bad. There was no forage on the winter range at all, and almost without warning came the unprecedented storm of October 22-23 when from 15 to 28 inches of snow fell in all parts of the park and effectually sealed up what little forage there was left on the summer and fall ranges. The animals were driven down in large numbers, and many crossed the park boundaries only to fall a prey to the merciless hunters waiting just across the line. Large numbers of elk, many bear, and some deer were destroyed. The antelope tried to leave the park, and even the buffalo left their ranges again and again to seek out forage still left uncovered. Other storms followed during the last few days of the month and served to emphasize the already severe conditions. With the game animals leaving the park on all sides to certain destruction by rifle or starvation, it became necessary to begin feeding hay at once, never to cease entirely until May 5, 1920. November proved another record-breaking month and so did December. January and February were comparatively mild and lead to hopes of an early spring. But March, April, and May proved particularly cold and stormy and were the bitter end to a long, hard winter. Six long months of continued work and hardship to save the lives of the remaining animals was the record of our service. The sections of our wonderful herds of wild game that remain are a monument to the hardships of bitter cold and raging storm cheerfully endured by rangers and other members of the National Park Service. And the thanks of all America is due to the friends that so unselfishly provided the funds for the work. Early in May, the grass began to grow and things took a turn for the better for our greatly weakened animals. Recovery proceeded rapidly; there has been a satisfactory increase in young animals, forage has grown well, and there is ample hay cured on the stalk for an average season. In addition to the forage distributed over the range, there has been 830 tons of excellent hay secured and stacked at various points for winter use.

The worst feature of the work ahead of us to preserve the game animals through the winter of 1920-21 is the Montana game law permitting elk to be killed from October 15 to December 24, and a second elk to be killed on payment of \$25. It is the same law that permitted the slaughter of 1919-20, and it is a disgrace to the great State of Montana.

Owing to the losses of last winter, not so many elk have been seen as usual by the tourists. Probably an additional reason is the steady stream of cars along the roads that has a tendency to keep these timid animals at a distance. On the other hand, antelope, deer, mountain sheep, and beaver were seen much more frequently than usual. Our wild animals are a great source of interest to all our visitors, and even a woodchuck or a porcupine creates some excitement.

BUFFALO.

Wild herd.—Sixty-one wild buffalo, of which nine were last year's calves, were seen in January by rangers in Pelican Valley. A bull was seen at Turbid Lake on April 14 by rangers; also 2 bulls at Marys Bay on April 20 and 26 buffalo of both sexes in Pelican Valley on April 27. No dead animals have been found. The herd is evidently splitting up, and it is thought that the reason is on account of the need for new pastures. I saw 8 near Turbid Lake along the east road early in June, and the next day Engineer L. L. Hill saw 15 in the same locality. It is evident that the wild buffalo have increased, at least to the extent of the calves noted above. Cold weather did not seem to affect these animals at all, and the effect of heavy snows was only to make them restless; with their great strength and ponderous weight buffalo can break their way to fresh feed, so it is not surprising that all buffalo seen have been in good condition. These buffalo will undoubtedly find fresh pasturage within the park as the herd increases; the wild herd probably contains well over a hundred animals at the present time.

Same herd.—One calf was born in October, after the date of my last report. This herd became uneasy even before the first big storms, and many succeeded in breaking away from the herd and came in to Mammoth repeatedly. As the hay at the Buffalo Farm for winter use was none too plentiful for the large herd during a long winter, it was desirable to keep them grazing as late as possible. Finally, on November 15, the bulk of the herd was taken to Slough Creek, where hay had been put up during the summer, and fed there until the end of the month. The calves were separated from their mothers and corralled at the farm, where they were fed hay.

During December, January, and February 385 buffalo were cared for at the Buffalo Farm. On February 23 the bulk of the herd was driven from the farm to Slough Creek to utilize the hay still there until March 25, when 127 bulls and steers were brought to Mammoth to be fed baled hay, leaving 225 cows and calves at the Buffalo Farm. Hay was exhausted at the farm and by great exertions 8 tons were hauled out from Mammoth.

All buffalo were taken back to the Buffalo Farm about May 1 and turned out to graze. The animals were thin in flesh, owing to short rations, but soon began to improve. During the winter about 300 tons of hay were fed at Buffalo Farm, about 75 tons at Slough Creek, and 39 tons at Mammoth. During the summer just finished the herd has ranged on the slopes of Specimen Ridge and Mount Norris, and 450 tons of hay were put up for the coming winter at the Buffalo Farm and 325 tons at the field on Slough Creek.

On December 6 an old bull was found dead near Junction Butte; a cow and a calf died near the mouth of Bear Creek during January, and two bulls near Knowles Cabin; in March a yearling bull died near the mouth of Blacktail Deer Creek; an 8-year-old bull was found dead August 17; one bull killed another at Mammoth on April 19. Fortunately, the only valuable one of these eight buffalo was the cow that died in January, and she had been badly crippled for some time.

A 8-year-old bull was shipped to the city of St. Louis on November 19, 1919; a 6-year-old bull to Aurora, Ill., on January 30, 1920; a 5-year-old bull to Hibbing, Minn., on June 30, 1920; a 8-year-old bull to Thermopolis, Wyo., on June 30, 1920; and a bull to the president of Park Zoological Society, Milwaukee, Wis., on June 30, 1920. On April 1 the new calves began to appear, but unfortunately the first two were frozen to death or died from the exposure; since then 42 more calves have appeared, and the tame herd now totals 442 animals.

On June 18, 15 bulls were brought to Mammoth and held in the smaller corral for the tourists to see. They created a great deal of interest, and it was estimated that they were seen by over 30,000 visitors.

The entire herd is in excellent condition, and barring another heavy fall of snow early in the season the natural range should keep them in good condition for some time. While the 450 tons of hay in stack at the Buffalo Farm should prove sufficient for the winter, it is possible that we may have to use some of the hay stacked on Slough Creek. The ever-increasing number of animals in this herd means that more and more hay must be provided each year, and the only safe way is to seed more and more irrigated ground. It is hoped provision for such improved land will be made each year as the increase in the herd warrants.

MOUNTAIN SHEEP.

The usual herd of mountain sheep came down to Gardiner Canyon during the October storm and remained in the vicinity all winter; at one time 18 animals were seen. There was also a small band on the walls of Golden Gate. On October 20 a male lamb came to the tent of two laborers near the buffalo farm and entered without any apparent fear. He was thin, but still seemed a healthy specimen. The buffalo keeper took him to the farm and fed him milk, bread, etc., but the sheep finally died.

Seven sheep were seen near Tower Falls in December; and in January 53 sheep were seen north of the Yellowstone River and 54 more to the south thereof. Only a few dead bodies were found during the winter, and it is evident that our estimated number of 200 in the park is too low, if anything.

The majority of the mountain sheep spent the winter at low altitudes, where they were able to pick up a fair living. On March 15 they began to move back on the high mountains, and in June the lambs began to appear. A small band remained on Mount Washburn, and at least two bands on the rim-rock along the Lamar Valley. These three bands were frequently seen by tourists during the season. On July 1 I saw four female sheep in the main automobile road between headquarters and Gardiner.

ANTELOPE.

The storm of last October brought the antelope down with a rush to the neighborhood of the lowlands about Gardiner and below. Most of the antelope tried repeatedly all through October, November, and December to leave the park, and a good many did leave. The latter wintered near Electric, Mont., and it is hoped that most of them returned safely to the park. The antelope remaining inside were fed hay in a special inclosure so constructed that the smaller antelope could feed therein undisturbed by the larger elk. Even under these conditions the herd was greatly weakened by the time spring came, and 19 were reported as dead. In April and May the antelope began to recover and move back on their summer range.

Horns were shed by the antelope bucks in late October and November. As the old sheaths came off, it was found that the new horns had already begun growing on the tip of the bone core so that at no time were the animals without a serviceable horn. This was in marked contrast with elk and deer, whose growing horns of April, May, June, July, and August were too soft and sensitive for use in battle or defense.

The antelope situation is a serious one. We have only 300 head left, and the number seems doomed to decrease. Antelope will not breed in captivity, and zoological gardens can not even maintain the ones they get. There are not many antelope left in the United States, and the total number is steadily getting smaller and smaller. Therefore, it behooves us to wisely care for pronghorn if we would prevent the extermination of this wonderful mammal.

MOOSE.

During the winter the moose of the upper Yellowstone, Snake River, and Bechler River Basins had a hard time and short rations, but seem to have come through with only a slight loss of mostly old and decrepit members of the species. During the summer they have recovered and are now vigorous and strong, with a satisfactory number of calves. I believe that there are about 800 moose in the park.

In addition to the above localities, little colonies have established themselves near the Riverside, Gallatin, and Sylvan Pass stations; on the headwaters of Hellroaring, Slough, and Soda Butte Creeks; and on Eagle Creek to the east of the park. They have been seen occasionally by tourists and always caused the wildest enthusiasm. One of our important moose ranges is the meadows and forests of the Bechler and Falls River Basins, in the far southwestern corner of the park. There is an irrigation scheme being developed which, if approved, will destroy this range and drive out these moose to certain destruction, and there is a fine band of elk also whose range will be destroyed there.

ELK.

The estimates of park superintendents as to the number of elk in the park up to 1911 varied from 25,000 to 40,000, but were usually mentioned as being "thousands" and no figures stated.

In April, 1912, a census was taken of the northern herd by park employees, and the count of 30,101 was then considered as approximately accurate.

If the park furnished ample winter range for the elk, as well as summer range, there would be no problem, but most of the grass in the park is covered with snow in winter so deeply that it is not available, and the only real winter range is the lowest land, 2 to 12 miles in width, along the northern border. In ordinary winters, this would furnish a good range for 15,000 to 25,000 elk, but over a large portion of the Absaroka National Forest, which joins the park on the north, the conditions are the same as they are in the park. Until grazing permits for cattle and sheep were granted on this range, 20,000 to 30,000 elk normally included in the northern herd, had ample summer range in the park and reasonable winter range included on both sides of the park line of the north.

Realizing the situation which confronted the northern elk herds on account of the curtailing of its natural late fall and winter range by encroachment of settlers and granting of grazing permits on the adjacent forest reserves in summer, a meeting was held in the office of the park superintendent in the park on September 9, 1912, in which representatives of the park, the United States Biological Survey, and the United States Forest Service participated. Previous to this date the question had not been entirely overlooked, for, acting upon suggestions of the park superintendent, the Department of Agriculture had, in the interests of the elk, limited the grazing districts for sheep in the Absaroka National Forest adjoining the park, and the States of Montana and Wyoming had set aside game preserves abutting the park where elk were protected absolutely from hunters.

At this meeting, while it was the intention to consider the situation from every angle, it has since become evident that the importance of keeping the winter range in the National Forest entirely free from grazing was not realized. The following points were unanimously agreed upon and recommended, namely:

- "1. That the whole elk problem should be handled as a unit.
- "2. That for the present the elk herd of about 50,000, which includes the park herd, the Jackson Hole herd, and those that range in the forest reserves just outside the park, should be maintained at its present size, of which the northern herd should not exceed 35,000.
- "3. That under present conditions the annual crop from the herd (killed under game laws of the adjoining States, shipped, etc.) should not exceed 7,500 to 8,000.
- "4. That some equitable arrangement be made whereby the people of the State of Montana may derive their due proportion of the benefits of the herd.
- "5. That for the present the existing sheep grazing lines on the Gallatin National Forest be maintained.
- "6. That so far as elk are concerned, the present lines on the Absaroka National Forest (Jardine-Slough Creek Trail) are reasonable and should be maintained."

About the only result of this meeting was to excite enough interest to keep the subject alive and cause an occasional census to be taken of the northern herd of elk, and these figures are now useful for comparison. The figures given below are sufficient to show just how serious the situation has finally become, and how easily possible the extermination of the elk herds may be if better protection and more winter range is not given them.

Results of census.—The first census taken, in April, 1912, mentioned above, showed 30,101 in the northern herd. The next census was taken April 9 to May 1, 1913, and showed an increase to 32,967 in the northern herd. The next spring, April 11 to May 2, 1914, the count showed 35,308 in the northern herd.

Following the most excellent conditions of the winter of 1914-15, no census was taken of the herd, but a conservative estimate of increase was 10 per cent, which would place the number in the northern herd around 37,192. Beginning April 5, 1916, a careful count showed 29,544 animals in the herd, and 1,958 were known to have been killed during the hunting season and shipped out alive to new ranges and city parks, thus accounting for 31,502. The discrepancy was accounted for by reliable reports to the effect that there was an unaccounted for increase in the southern herd, indicating that a heavy migration from the northern to the southern herd had taken place, which is not surprising, as their summer ranges sometimes might overlap.

The worst setback to the northern elk herds of record, except that of the past winter, occurred during the very severe winter of 1916-17. This was said by many old-timers to have been the longest and hardest winter in their memory—in fact, it was much worse than was last winter, though the elk did not suffer so much as forage conditions were better and the open season for hunting in Montana was shorter. We had but 212 tons of hay for feeding the wild animals, including antelope, deer, and mountain sheep, and up to this time it had not been the practice to feed the elk at all; but efforts were always made to keep them away from the feeding so as not to interfere with the smaller animals which are scarcer and not so hardy. The winter was so severe, however, that it was impossible to hold the elk back, and they came in and ate much more than their share of the hay that was fed. There were very heavy losses of all kinds of wild animals, as well as of domestic stock in the surrounding country,

and the official count made from May 22 to June 9, 1917, placed the number of elk in the northern herd at 19,345, but accounted for 23,745, the difference having been killed during the hunting season and shipped away alive. The apparent loss from severe weather was something like 25 to 30 per cent of the herd.

The winter of 1917-18 was mild, the game had plenty of winter forage, and the losses were slight. No census was made of the elk. About 350 tons of hay were fed from January 5 to March 19, and about 3,500 elk came in to share it with the deer, antelope, and mountain sheep.

The winter of 1918-19 was also warm—the mildest on record—with warm temperatures and but little snow. The wild animals remained scattered all winter, and did not come in at all for forage, as they had plenty on the range. Several thousand elk went outside of the park into the national forest on the north, apparently from force of habit, as they did not need to go for forage, but this happened after the close of the open season for hunting, and they were not molested to any extent. The increase in the herds was apparently normal and the losses from all causes slight. No count was made, nor would it have been practicable to have made one, as the elk were too much scattered all winter, the snow being so shallow that many of them remained on the summer range all winter.

The history given above is only reviewed for comparison and to better emphasize the fearful tragedy that occurred during the long, cold winter of 1919-20.

From the figures given, 19,345 elk in the northern herd in June, 1917, and the fact that the two winters following were quite mild in character with no apparent losses in the herd, it would not seem improbable that there were 25,000 in the herd a year ago. Last June, after the most disastrous winter which our wild animals have ever and I am reliably informed that the southern herd fared but little if any better. This had to face, our rangers estimated the survivors in the northern herd of elk at 11,000, loss of nearly 60 per cent in one winter is alarming and indicates most forcibly the possible danger of complete extermination of this most noble race of animals. The story of the long winter of hunger and suffering is heartbreaking. The conditions which caused it were anticipated, and preparations on a scale thought to be beyond any possible necessity were made.

The very mild winter and early spring were followed by an unusually dry summer. The winter snows melted early, rains were scarce, and lack of moisture prevented the usual growth of grass on the ranges. As it was plain before the end of summer that there would be but little natural winter food for the wild animals, preparations were made for acquiring sufficient hay to cover the necessities of an ordinary winter. There were already on hand 293 tons of hay available for feeding them, in addition to that provided for buffalo and the domestic stock. On October 22 came a very severe snow-storm, which covered the whole country with from 1 to 3 feet of snow, and stopped all motor traffic throughout the park. Even the road from headquarters to Gardiner, which seldom is filled with snow until late in winter, had to be plowed out with a power grader before it was passable. At first it was taken as a joke, as it was hardly thought possible that this could be the beginning of winter, but no relief came, and we finally had to bring in our trucks that were snowed in out in the park with the caterpillar tractor, which could travel over the snow by packing it down.

The elk immediately began going down and leaving the park by thousands, and in an effort to hold them inside where they could not be slaughtered, we immediately began feeding hay. It at once became evident that we would need all the hay we could get, and during November every cent available from our appropriation was used in purchasing hay in stack from farmers down the Yellowstone Valley, just below the northern entrance. During the month 870 tons of alfalfa hay were purchased, at \$25 a ton in stack, at distances varying from 1 to 9 miles from the feeding grounds, and preparations were made for hauling it on trucks, or sleighs if snow came too thick to use the trucks. The whole situation was carefully reviewed and plans were made to provide what was thought to be enough hay to bring the animals through in fair shape. A deficiency appropriation was asked of Congress and was passed, including \$30,058.59, which was necessary to pay for sufficient hay to last through to nearly April 1, when we could reasonably expect good weather. But to provide for further contingency, an additional sum of \$8,000 was carried in the bill to be used only in case it was actually needed.

From the time of the big storm the latter part of October, until May 1, was a period of constant anxiety and hope that the weather would moderate and give relief to the starving elk. The \$8,000 had to be used to continue the feeding beyond April 1; on April 9 no change was in sight, and it became apparent that the hay on hand would not be enough unless moderate weather were to come suddenly, and we had been disappointed too often to count upon this. It was quite evident that we would be out of hay before April 20, and with continued cold, backward weather, the elk, which had been on a short ration all winter and were already thin in flesh, would all die for the want of a few tons of hay to continue the feeding until grass grew.

An appeal was made by telegram to the American Red Star Animal Relief and a few prominent men who had become interested in the unusually serious situation which was confronting the elk herds and who had offered to assist if such a desperate contingency arose. These gentlemen responded generously and quickly, donating a total sum of \$4,703, with which 103 tons of additional hay were purchased, which served to save the several thousand elk which we had been keeping up on a daily ration of hay all winter. The names of the parties who so generously contributed to this fund are as follows:

American Red Star Animal Relief Association	\$1,500
National Parks Association	353
Mr. William C. Gregg, Hackensack, N. J.	2,000
Mr. H. M. Blackmer, Midwest Refining Co., Denver, Colo.	500
Hon. Stephen T. Mather, Director, National Park Service	350

4,703

We were very fortunate in having the last purchase of hay located and being able to get it on short notice, for it grew scarcer and raised in price almost daily during the spring months. The price paid for hay for these animals varied from \$25 per ton in stack, near Gardiner, in November, to as high as \$52.60 per ton for baled alfalfa

hay delivered at Gardiner in April. A total of 1,851 tons of hay was fed out last winter to buffalo and other animals, of which 422 tons were fed to the tame buffalo herd and the balance to our antelope, deer, mountain sheep, and about 8,000 elk. This hay cost a total sum of \$61,209.23, of which \$4,703 was donated as above, and the balance of \$56,506.23 was expended from park appropriation also referred to above. As stated before, 212 tons of hay were used for feeding wild animals during the severe winter of 1916-17, and 850 tons were fed during the mild winter of 1918-19, compared with 1,429 tons used for the same purpose during the past winter. Had we not been prepared, the loss must have been something fearful, amounting almost to total extermination of the herd.

The following table contains data showing some of the extremes, and is designed for comparison of conditions from year to year affecting the welfare of the buffalo and other animals, and particularly emphasizes the mildness of the winter of 1918-19, the dryness of the summer of 1919, and the severity of the following winter:

Comparative weather data to illustrate contrast in winter seasons of 1918-19 and 1919-20.

	October.	November.	December.	January.	February.	March.	April.	May.	Average for winter.
Lowest temperature:									
1918-19 (mild).....	17	-5	-20	-5	-2	-6	15	17	.....
1919-20 (cold).....	-6	-19	-31	-11	-8	-25	-3	24	.....
Average temperature:									
1918-19 (mild).....	44	27	21	22	19	29	39	47	31
1919-20 (cold).....	30	23	15	23	21	24	31	43	26.25
Normal temperature (33 years).....	42	29	22	18	20	26	37	47	30
Total precipitation:									
1918-19.....	2.27	.66	.39	.88	1.64	1.00	1.41	1.29	1.19
1919-20.....	2.69	.80	2.13	.28	1.02	1.95	1.33	2.84	1.63
Normal precipitation (33 years).....	1.14	1.44	1.82	2.24	1.84	2.18	1.38	1.91	1.75
Total snowfall:									
1918-19.....	5.0	5.9	3.7	10.0	18.2	9.8	7.8	5.7	8.26
1919-20.....	28.6	6.4	27.7	2.9	12.3	20.0	4.8	3.2	12.98

¹ Record breaker for month.

The dryness of the summer of 1919 is shown by the following figures on temperature and precipitation as compared with normal:

	June.	July.	August.	Average.
Average temperature (warm).....	59	65	61	61.67
Normal temperature (33 years).....	56	62	61	59.67
Total precipitation (dry).....	.14	.80	.40	.4467
Normal precipitation.....	1.64	1.18	1.02	1.28

The severe winter conditions suggested by the above table were unparalleled in the records of the Weather Bureau.

What became of 14,000 elk which were missing in our northern herd on June 1 last? Our records indicate that 449 were shipped out alive to city parks and for stocking other ranges, of which 298 went to Canada. It has been estimated that about 8,000 were killed during the hunting season in Montana—October 15 to December 24—or, if not killed, were wounded so that they crawled away and died. Reports have it that about 400 were killed in the West Gallatin country from the small part of the northern herd known as the Gallatin herd before the heavy snow came which kept hunters out of that section the balance of the season. It is hard to believe that the balance of those missing died of sheer starvation and exposure, yet such was probably the case if the number in the herd last fall was not greatly overestimated.

Hunting season.—The laws of the State of Montana permit the killing of elk in Park County from October 15 to December 24. These laws are unworthy of a civilized State. They are indefensible. The results of such a law, as were in evidence last fall, would seem little short of criminal. The slaughter is only rivaled by the tremendous slaughter of buffalo on the plains in the early days, which, it is well known, finally practically resulted in the extermination of the species.

Hunters came in droves, from all directions and every method of transportation—on foot, with saddle and pack trains, automobiles, trucks, but by far the greater number came on the daily trains to Gardiner. For several weeks the outgoing trains were loaded with carcasses of elk, often requiring an extra express car to handle them, and the depot platforms at Gardiner and the next station below, at Corwin Springs, looked like slaughter pens.

The residents of the Yellowstone Valley for 20 miles down enjoyed good business, for, in addition to getting their own meat, they had in use all kinds of transportation, pack outfits, farm wagons, automobiles, and trucks, hauling dead elk from where they were killed to the depot at high rates. They also charged rates that brought them a good profit for board for the numerous hunters who came in by train. The hunters were of all types and professions—farmers, doctors, lawyers, merchants, etc., and also included many women and children—mostly, however, from Montana points. Many of them had never hunted before, knew but little of the use of a gun, and nothing whatever of butchering and caring for the meat after the animal had been killed; and as for the park line, most of them trusted to good luck or the kind mercies of residents of

whom they might inquire as to its location, for but few engaged and paid for the services of a guide. Thanks to a kind Providence, but few of them did stray across the line. Those who did trespass, however, though usually they did so through ignorance or carelessness, were arrested and tried before the park commissioner and paid their fines.

Due to the large number of inexperienced hunters in the field, hunting was a hazardous proceeding, and it was extremely fortunate that no one was killed by stray bullets, which were much more numerous than were those which were well directed. The most popular method of hunting was for a number of hunters to lie in wait until a band of elk, consisting of bulls, cows, and calves, came across the park line, when they were immediately surrounded by several hunters, all of whom would begin shooting into the herd, and all would continue shooting until their ammunition was exhausted, or until the elk all dropped or got away, usually wounded. Then each member of the party who had participated in the fusillade would come forward and claim his or her elk, until all that had dropped were claimed.

Most of the hunters who came had no trouble in getting their elk, some of them by going but a mile or two from town. A story is told of one man who came to Corwin Springs and put up at a hunting camp maintained there near the railroad and next morning killed his elk on the east end of the bridge across Yellowstone River just as it was making its way toward the Gallatin Game Preserve at the other end of the bridge.

By the middle of December the number of hunters had dwindled, probably because all who cared to had secured their elk, though some were killed daily right up to the close of the open season, December 24. An effort was made to tabulate the total number actually killed in Montana during the hunting season, but no accurate figures were procured. It is certain, however, that the number ran up to several thousand and that many more died of wounds and were never discovered.

Protection of elk.—Adequate patrols were maintained along the park borders throughout the hunting season, and several hunters who were found across the line with unsealed firearms, or in possession of trophies, were arrested and tried. During the hunting season the State game wardens also had deputies on the job to see that the laws were complied with by hunters, and a few were arrested and fined for hunting without license, trespassing upon the game preserve, etc., but transgressions usually happened through ignorance, as the laws of Montana were sufficiently broad so that no one was obliged to violate them to get their meat. The Forest Service also had several rangers stationed in the Yellowstone Valley during the winter engaged in patrolling for game protection after the hunting season was over, and our ranger force assisted by making numerous patrols in the Gallatin Game Preserve west of Yellowstone River along the park lines. There was no occasion for criticism as to the manner in which the elk were protected, as everything possible was done with the means at hand to protect them and prevent them from starving to death. The main drawback was the fact that the State laws permitted unreasonable slaughter by naming so long an open season, and lack of sufficient hay and open range to provide them with winter forage to keep them from starvation.

Feeding hay and special care of elk.—As previously stated, 1,429 tons of hay were fed to our wild animals last winter, most of which was eaten by the large elk herds. The maximum number of elk taking this hay at any one time was estimated at 8,000. Feeding was begun before the end of October and continued daily until May 3. Most of the work was done by park rangers, and at times it was most strenuous, especially in days when the mercury hung away below zero, during blizzards, etc., when the necessity for feeding was even greater than in pleasant weather. Trucks were used when the roads were free enough from snow so they could get over them, but for long periods it was necessary to resort to the use of teams and sleighs, changing to wagons when the snow disappeared on a part of the road and remained on the balance. More than 1,000 tons of the hay fed was taken from the stack and hauled in racks, the distance hauled varying from 1 to 12 miles. It took several rangers' entire time to handle this work, and overtime, frozen fingers and ears, and going without lunch were common occurrences. On occasional days, when the weather warmed up so less feed was required, or when hauling from near-by points, the spare time was taken up repairing equipment, changing hay racks from sleighs to wagons or trucks, or vice versa, and hauling away and disposing of the dead bodies of elk that expired on the feeding grounds, and these were not few. During all of this period the elk as well as other animals, even including our tame buffalo herd, showed a continual strong tendency to go down to lower levels, and every effort was made throughout the winter to keep them back in the park. The strain of overwork, anxiety, and constant responsibility and fear of disaster to the elk herds was continuous, and much credit is due our ranger force for the uncomplaining and patient manner in which they handled the situation.

Elk shipped from the park.—Elk were captured in the park near Gardiner, Mont., and shipped to city parks and for stocking ranges, as follows:

Date.	Destination.	Number.
1919.		
Dec. 5	To City Park of St. Louis, by express, crated.....	12
3	To Platt National Park, Sulphur, Okla., express.....	3
15	To Palisades Interstate Park, New York.....	65
1920.		
Jan. 20	To Rocky Mountain Park of Canada, Banff, Canada.....	200
21	To city of Minneapolis, Minn.....	2
21	To Agricultural and Mechanical College of Texas.....	3
23	To city of Aurora, Ill.....	4
Feb. 2	To Sonora Experiment Station, Texas.....	5
14	To city of Allentown, Pa.....	3
Mar. 2	To Jasper Park, Canada.....	98
3	To San Antonio, Tex.....	2
28	To Sonora Experiment Station, Texas.....	2
Apr. 10	To New Mexico.....	50
		449

The total number of elk captured in the park for shipment since this practice was begun in 1911-12 is as follows:

Winter of—		Winter of—	
1911-12	137	1917-18	145
1912-13	538	1918-19	101
1913-14	99	1919-20	449
1914-15	375		
1915-16	618		2,958
1916-17	496		

Deprivations by elk.—The complaints from farmers outside of the park of damages from the presence of elk on their ranches were not as numerous as usual, but this is probably accounted for by the fact that we bought all of their hay at a good figure, so they had nothing left except fences to be damaged.

Present conditions.—The past summer has been one of the best on record so far as conditions for growth of vegetation was concerned, and the prospects for an easy winter for the wild animals are first class. All reports received during the latter part of the summer from rangers who have been in contact with the elk herds indicate a good crop of calves. The deaths from starvation last winter included nearly every calf in the herd. In many cases the mothers were shot during the hunting season, leaving the young to snift for themselves, and they soon died of cold and lack of a mother's care. We are not prepared to feed the wild animals this winter, as no hay except what was cut and stacked on Slough Creek and the Buffalo Farm is available, and no funds are available for the purpose. With the heavy growth of excellent forage on the ranges, it is to be hoped that the elk and other animals will winter well without being fed hay, as there is but little doubt that the annual feeding of hay tends to domesticate them and make them dependent upon being fed every year. Even last winter when the weather was so severe and conditions so serious, reports indicated that the few hundred elk that remained on the usual ranges along the north line of the park and in the national forest just outside fared better, and the percentage of loss was less than among those that hung around constantly waiting for their short ration of hay.

Should the emergency arise, however, it will be necessary to meet it by calling for a deficiency appropriation for purchasing hay. Fortunately, hay will be cheaper than it was last year, as it is much more plentiful, due to a good season. It is to be hoped that the fall may be long and open, so the elk will not leave the park in great numbers before the close of the Montana hunting season, as another slaughter like last year will mean almost their extermination, and there has been no change in the law since last fall.

Gallatin herd.—While usually considered as a part of the northern herd of elk, the herd of somewhere around a thousand elk that summers in the park and always winters in the Gallatin National Forest, just outside of the northwest corner, is quite separated from the main northern herd, and conditions are often quite different for them. Their winter range is usually amply sufficient for their needs, and even last winter the loss was not excessive. About 400 were killed by hunters after the season opened, and before the early snows stopped the use of automobiles into that section—for automobiles have come to play a large part in the hunting and fishing sports, and many who make trips for this purpose would not do so had they to go any other way. The same Montana game laws which permitted the heavy slaughter near Gardiner up to Christmas last fall apply, however, and the danger of complete extermination of this little herd can not be overlooked.

Southern elk herd.—The conditions in Jackson Hole, where the southern herd always winters, were similar to those that governed on the north except that the State laws protected the elk by a shorter open season. The best reports received indicated that about a thousand were killed by hunters during the open season of Wyoming. Such reports as were received from time to time by hearsay during the long winter indicated about the same difficulty in securing sufficient hay as we encountered, and I understand that the price of hay went even higher. Cotton cake was purchased also and fed successfully. It is a well-known fact that many cattle owners who use the summer range in Jackson Hole for pasturing their stock had to take them out to winter last year. There are supposed to be about the same number of elk left in this herd as in the northern herd. In June, Assistant Chief Ranger Brooks accompanied representatives of the United States Biological Survey and the United States Forest Service on a trip up Buffalo Fork to examine the condition of the elk range in that section.

The Biological Survey reports that 1,923 tons of hay were fed to the southern herd of elk, 850 tons of which were raised on the elk ranch, 573 tons purchased, and 500 tons supplied by the State of Wyoming. The cost of the 1,423 tons supplied by the Biological Survey was \$36,271.50. At this time I am unable to state what the 500 tons of hay supplied by the State of Wyoming cost.

A few hundred elk spend their summers in the Bechler and Falls River country, in the southwestern corner of the park, and in certain mild winters they sometimes winter there also. Last winter about 400 of these left the park into Idaho and never returned, which reduces this small herd by more than half.

DEER.

The winter storms and accompanying cold weather did not have such a quick effect on the deer, for they browsed a great deal and were not dependent on grass to such an extent. Still, even in their case, large numbers left the park in October, November, and December, and many were killed by hunters. In spite of this and the fact that 49 mule deer and 2 white-tails were found dead, I do not believe that they suffered any serious diminution in numbers. Most of those that did leave the park returned when the proper season arrived. It was interesting to note that, with the deer more than any other animal, small bands were cut off by the early storms in remote sections of the park and managed to survive the winter. In all, about 200 deer were fed at Gardiner and 50 near headquarters.

As early as January 6, the deer began to shed their horns. As it was noticeable that these early shedders were sick or weak, I believe it was a consequence of their condition that led to early shedding. One buck was seen with horns as late as March 25.

About March 17 most of the horn butts began to swell and new horns to grow, to complete their growth during late July; and the skin on the new horns began to wither and fall in late August. About the 25th of May the color of the mule deer changed from the gray of winter to the red coat of summer, and changed back again to the gray coat about September 1.

About the normal number of fawns have appeared since May 1, until now we have about 1,200 mule deer and 100 white tail deer in the park.

WOODCHUCKS.

Woodchucks first appeared on February 5, were out a few days, then disappeared to make their final emergence from hibernation on March 17. The last one seen in the fall was on September 5. Although this is considered a rather insignificant animal here, the tourists have been much interested in them all summer. Three tame woodchucks at the Canyon ranger station have attracted unusual attention.

BEAVER.

Beaver are so numerous in the park that there is practically no way of estimating the number. Almost every stream has its colonies. Beaver signs in the shape of dams, houses, canals, runways, stumps, and pieces of trees cut for food are abundant and excite much interest among the tourists. There are extensive workings in a small gulch along the road to Cooke City leading down from the west to the Yellowstone River. This gulch was formerly filled with quaking asp, but is fast being stripped of its trees by the beaver. Many tourists from Camp Roosevelt saw the beaver at work there in the evenings. Another beaver dam and pond is at the junction of Lava and Lupine Creeks beside the main road from Tower Falls, 5 miles from Mammoth. At this point, it was a common occurrence for tourists to see beaver and observe their interesting ways in the late afternoons and evenings.

PORCUPINES.

Porcupines were numerous all over the park plateau. As a rule they lived on grass and small vegetation, but in winter and early spring they ate the bark from pine and spruce trees. The damage was not great, however, as the trees were too thick in most places and they are not often completely girdled and killed. Porcupines were often seen, especially in the evening, and are very amusing to the tourists.

JACK RABBITS.

Jack rabbits changed completely from the white pelage of winter to the summer coat by May 10. They were quite common about Mammoth and Tower Falls and the other open, low-lying parts of the park. The little cottontail rabbits did not change their color in winter and were common below Mammoth and along the Gardiner River to the north boundary. The snowshoe rabbit was an abundant inhabitant of the forested areas of all parts of the park and changed to a pure white coat in winter. They were often seen at night along the loop roads.

Among other animals that were often seen and proved interesting to the tourists were pine squirrels, three different chipmunks, two species of ground squirrels, muskrats, conies or rock rabbits, badgers in the open country, and five species of bats. Canada lynx, bobcat, fox, wolverines, and fishers occur here, but were so rare as to be seldom seen even by our rangers. Otter, pine marten, mink, skunk, two species of weasels, flying squirrels, woodrats, pocket gophers, jumping mice, nine other species of mice, and three different shrews, were common everywhere, but still not apt to be seen by tourists because most of them were active only at night.

COYOTES, WOLVES, AND MOUNTAIN LIONS.

These are by far the most destructive of our carnivorous animals, and efforts are constantly made to keep them down to a reasonable number. It is hardly practicable, even if it were desirable, to entirely exterminate these animals, but a certain amount of hunting and trapping by our rangers each year has a most salutary effect.

They usually kill annually quite a large number of young elk, deer, antelope, and mountain sheep. This year, however, their depredations have not been heavy. Apparently the mountain lions left the park altogether during the severe weather, and the coyotes and wolves found so many dead and dying animals that they gave over their hunting to a large extent. Two rangers gave all their attention from January 1 to May 31 to hunting and trapping the carnivora and other rangers aided whenever possible. In all, 107 coyotes and 28 wolves were destroyed.

BEARS.

Black bears.—Black, brown, and cinnamon bears are all included in the term "black bear," as scientists have agreed that each is but a different color phase of the same species. Black bears were numerous and abundant right up to the snowstorm and cold weather of October 22-23, and then all disappeared at once. There had been little evidence of hibernation—den digging before the storm, and the snow fell too deep for all of them to find suitable places, yet they disappeared so suddenly that it was thought probable that most of them left the park. When they reappeared in the spring it was late, and not so many bears as usual came back. It is quite likely that many were trapped and shot outside the park.

Early in the season there was considerable disappointment among the tourists at the scarcity of bears, but by the 1st of August black bears were being seen by practically every one that wished to in the neighborhood of Old Faithful, West Thumb, Lake, Canyon, and Tower Falls. Depredations by bears were of minor importance, and none were killed except one at Lake, early in the season, for destruction of automobiles and storehouses.

The garbage dumps at Lake and Canyon were used as heretofore, and a new dump established near Old Faithful. It was a regular practice for people from the hotels and

camps to go to see the bears congregated at these three points. Wires were firmly stretched between trees and posts to keep people from going beyond the danger line, and rangers were placed on duty with rifles to protect them. This is one of the most interesting features of the park to the majority of tourists, but requires careful regulation.

But even more interesting than the bear dumps was a clever yearling bear that frequented the highways about the West Thumb and daily "held up" passing automobiles. As a rule the tourists were willing victims of the "hold-up bear," and most of them would risk being tried before the United States commissioner for violation of park regulations, which prohibit "approaching, molesting, or feeding the bears," rather than turn a deaf ear to the demands for candy, cake, sugar, etc. This rule is the most difficult to enforce of all the park rules and regulations.

Probably we still have a hundred black bears left, and I see no reason to doubt but that they will soon become as abundant as ever. Certainly they are as fat and sleek at this time as it is possible to be.

Grizzly bears.—The grizzlies do not seem to have had so much trouble with the weather last winter: at any rate a larger proportion returned to the park. After the scare caused by the operations of the bow and arrow hunters, employed by the California Academy of Sciences, under department permit, had time to wear off, grizzlies began to appear again near the Canyon, where from 5 to 15 were seen every night after sunset. A few appeared at the lake also, and some at other remote points.

I believe there are at least 40 grizzlies in the park now. These bears have been very well-behaved this year. They have made no depredations, and none have had to be shot. They are now in the best of condition to enter hibernation.

On December 1, 1919, the museum of the California Academy of Sciences applied for permission to collect four grizzly bears, representing that the Yellowstone National Park was the only place where they could be secured, and that the mounted group would be of great scientific value. This permission was granted by the department, and about June 1 representatives of the academy arrived to secure the specimens. The party proceeded to the Grand Canyon, where they established headquarters. Soon three grizzlies were killed, and the party was notified that only one more bear could be killed.

As there were difficulties in finding another suitable specimen, permission was requested to kill a large grizzly seen near the Canyon garbage dump. This permission I refused on the ground that I felt that this would spoil the amusement the tourists were then taking in seeing these bears.

Nevertheless, the party stationed themselves on the trail used by the grizzlies in going to the garbage, and there killed four more bears.

After this killing, no bears, either black or grizzly, appeared for nearly 10 days, thus causing disappointment to thousands of tourists. Not only were seven bears killed, but four young cubs were left motherless and one was believed to have been wounded.

A full report on the details of these killings has been made to the service, with recommendation regarding permits of this character.

BIRDS.

While we have an even 200 different species of birds on our lists, only 65 are common and likely to be noted by tourists in the park. The most remarkable and interesting are the California gulls, white pelicans, mallards, Canada geese, blue herons, sandhill cranes, Richardson grouse, ruffed grouse, osprey, kingfishers, Williamson sapsuckers, red-shafted flickers, Rocky Mountain jays, ravens, Clark nutcrackers, meadow larks, Brewer blackbirds, Cassin purple finches, vesper, white-crowned, and song sparrows, pink-sided juncos, green-tailed towhees, western tangers, tree and cliff swallows, yellow and Audubon warblers, dippers or water ouzels, mountain chickadees, Townsend solitaires, western robins, and mountain bluebirds. Hawks, owls, osprey, mallards, geese, and pelicans create a great deal of interest because our absolute protection makes them so tame and easily studied.

The spring migration of birds began early in March and was not completed until after June 1. As a result of the backward season, migration was later than usual, and owing to our ponds and lakes still being frozen very few shore birds, ducks, and geese stopped here at all. The fall migration began with the willet in July and is still going on normally at this time.

California gulls and white pelicans nested as usual on Molly Island; there were about 200 young gulls and 100 pelicans raised to maturity. The beaver ponds and sloughs of the upper Yellowstone Valley had a great many nests of mallard and blue-winged teal, while Barrow goldeneye and mergansers nested in other localities near by.

Canada geese had their homes in the south end of Yellowstone Lake and on Grebe Lake. In many places they showed a preference for the tops of beaver houses as nesting sites. During the winter there were about 50 whistling swan in the park, mostly about the lake outlet.

During the summer there were at least one pair of trumpeter swan here, but the nest was not located, although it was probably here somewhere.

The osprey nested in the usual numbers in Gardiner and Yellowstone Canyons and about Yellowstone Lake; unfortunately a series of heavy hailstorms in late July destroyed most of the eggs at the Canyon, but the nests about the lake and in the Gardiner Canyon and near the road to Cody escaped. As usual, the nesting osprey created a great deal of interest at the Canyon.

A pair of bald eagles again had their nest on a pine on the Yellowstone River shore 1 mile north of the Fishing Bridge.

Last October and November the Rocky Mountain jays, or, as colloquially called, "the camp robbers," became very bold and frequented all the camp sites, and even became so shrewd as to watch all the park roads for possible campers that might have food for them. As usual, the Clark nutcrackers congregated about Mammoth during the winter in search of scraps from the kitchens; later we found them destroying ticks on the elk bedding grounds. They were later than usual in starting their nests, although even this year they began nesting early in March and long before the snow had gone.

Usually all our magpies go down on the plains below 5,000 feet elevation to nest, but this year was memorable for the finding of an occupied nest in the Lamar Valley where four young magpies were reared.

Water ouzels began to sing about Christmas time and kept it up all through the winter, often giving a concert in the most rigorous part of a very hard winter. The pine skinks appeared with the first dandelion seeds in June and were extremely busy for several days destroying great quantities of this undesirable plant.

Cliff swallows, bluebirds, wrens, and robins nested about the buildings at Mammoth; bluebirds, flickers, and robins about Old Faithful Inn; cliff swallows near the lake outlet; and cliff swallows, bluebirds, and osprey about the Canyon.

On the whole, the year has been a favorable one for the birds. Not one of the many species has been lacking to any great extent, and a few have been more numerous than usual. Birds formed no inconsiderable part of the attractive features of the park. Whether it was the songsters of June and July, the nesting osprey at the Canyon, the wonderfully tame hawks and geese and ducks of the roadside, or the gulls and great white pelicans at the lake, somewhere along the trip birds were sure to make themselves noticeable even to the novice in bird lore.

ANTLERS.

For several years permits have been given to take shed elk horns out of the park for souvenirs. As the bull elk shed their horns every year, and in certain years many more die, these horns are quite plentiful, and while they are very common in this part of the West, to an easterner, especially to the boys, they are very highly prized as souvenirs of the park and their memorable trip. Travel was so heavy and horns so plentiful during the past season that it seemed as if at least half of the private cars leaving the park had a pair of elk horns, and many who had met them on the road seemed as eager to procure them as they were to view the wonders of the park. There was such a demand for them that parties were found searching for them several miles away from the road, and the danger of their becoming lost or of setting forest fires was so great that it was decided to be a matter of good policy to discontinue the practice, which was done on September 1.

Several parties who had met people going out with horns on August 31 were very much disappointed that they were not allowed to acquire a pair.

FLOWERS.

More than 2,000 tourists made definite inquiries of our park naturalist, and many times that number showed interest in our wonderful wealth of flowers. We have over 800 species listed, besides 100 or more grasses. Of the flowers, about 175 are so common as to attract general attention. Conditions vary from the warm, lower valleys where the bitterroot wild rose, prickly-pear cactus, mentzelias, and the wild iris grow, up through the lodgepole forests and the Engelmann spruce areas to the arctic-alpine zone, where there are no trees and only the hardest alpine species, such as the alpine forget-me-not, the dwarf lungwort, and the mountain yarrow and lupine grow. The climate is dry everywhere in the park, and consequently there are sudden and great changes of temperature with frequent summer frosts.

The large, blue, woolly pasque flower was quite common at low altitudes during early June. The dark, purple larkspur began to bloom a little later and gradually worked up, step by step, to timberline. Still later, the monkshood began blooming in shady, damp nooks where the long-spiked heads were very conspicuous. At times the hills between Mammoth and Gardiner, and about Tower Falls, were literally covered by the rose-colored blossoms of the bitterroot.

Lupines were our commonest flowers in July and August, covering the country from the lowest valleys to the mountain tops with large masses of light blue at low elevations to purple at high altitudes.

Wild strawberries were abundant and large and sweet. Wild roses were numerous about Mammoth and Tower Falls. In June the service-berry bushes were a mass of sweet-scented white bloom about Mammoth, only to extend rapidly up the slopes as high as the Mud Volcano by July 6. Fireweed began to bloom about July 20, and soon the park was filled with its flaming, bright-bued spikes; probably it was the most conspicuous and showy of the August flowers. August was also the blossoming month for goldenrod along the loop roads. At the end of the season the purple asters were abundant from the lowest elevations to the very top of Mount Washburn.

Fringed gentians differed from all other flowers in not being as common as usual. Ordinarily this is the most distinctive flower, and certainly it is the most sought-for and most frequently inquired about of all.

The Mount Washburn Road became much talked about because of the wonderful border of a mile or more of deep purple phacelia, or waterleaf, that was as true and even as if set out by human hands. This border lasted throughout the season and was one of our floral wonders. Forget-me-nots of three species were particularly abundant along the mountain roads. Beardtongue bloomed in masses of long, showy, purple spikes in a number of localities beside the roads. Among the masses of blossoms the brilliant Indian paintbrush was not as conspicuous as usual. Orchids were abundant, but never many in any one place. The iris bloomed abundantly in a few wet meadows below 7,000 feet. The canas was very abundant on a large meadow 2 miles west of the Lake Hotel, but there were only a few blossoms elsewhere.

As a rule our flowers were wonderfully fine and abundant. At times the whole countryside flamed with a rich medley of many blossoms. This was due, no doubt, to a late spring, well-distributed rains, and plenty of warm sunshine.

GEYSERS, HOT SPRINGS, AND SIMILAR PHENOMENA.

At Mammoth, the big spring above Jupiter Terrace discharged less water than usual, and seemed much less active; but Hymen Terrace became more active, and a number of new, or recently abandoned, terraces began building up, and the discharges were more active than ever. The slowly drying Angel Terrace disclosed a beautiful pink tinting; there has been a wonderful growth of algaous matter in the Hymen Terrace.

At Norris, the Constant has practically discontinued operations, and its activity has been transferred to the Whirligig Geyser directly across the footpath. The Monarch and the Bathtub have not played at all. The Black Growler shows evidence of regaining its power of 20 years ago.

At Fountain, both the Fountain Geyser and the Great Fountain Geyser continued to play at quite regular intervals of about 4 hours for the former and from 8 to 12 hours for the latter. The Fountain Geyser played from its oldest crater.

There were no marked changes at the Upper Geyser Basin except that the Old Faithful Geyser decreased its interval of eruption. It played at an average of 77 minutes in October of 1919, 64 minutes in June, 1920, less than 63 minutes in July, and a little less than 64 minutes in August. The Daisy Geyser played at an average interval of 75 minutes in October, 1919, when its close similarity to Old Faithful was notable, 96 minutes in June, 82 minutes in July, and 90 minutes in August. The Grotto Geyser played frequently but did not develop any regularity. The Giant played on an average of about every eight days.

The Giantess played irregularly at an interval of seven days or more; on August 24 this geyser started a very fine eruption and played intermittently for 37½ hours, the longest eruption of which I have any record. The eruption was, at the same time, a very beautiful and powerful one. Usually the Beehive Geyser played two or three times after the Giantess, but in the case of this powerful eruption the Beehive did not follow at all, thus tending to confirm suspicions of well-posted observers of the park force that when the Giantess gives a fine eruption there is not enough water left for a display of the Beehive.

The Grand Geyser has become our most notable geyser; it has no known indicator, but it has played once or twice a day, and lately has shown some evidence of playing quite regularly every 11 hours. There is evidently a close connection between the Grand and Sawmill Geysers. The Castle Geyser has been very irregular and disappointing. After a quiescent period extending over several years, the Lioness and the two Cubs gave a very fine eruption, lasting several minutes, on August 7.

FOREST FIRES.

No forest fires of any consequence occurred during the past season. This condition was due partially to the fact that the season was unusually wet and partially to the careful motor-cycle patrols and the efficiency of the ranger force in general. This was in marked contrast to the season of 1919, when eight serious forest fires occurred during August alone, burning over an aggregate of 6,388 acres, and the total cost of fighting fires was \$29,968.05.

FUEL.

The strike of coal miners late last fall was felt keenly by the cities and villages of Montana, but fortunately we had purchased our coal before it occurred and were not affected. To relieve the shortage in the village of Gardiner, at the northern entrance, permission was given by your office to allow the townspeople to open up a coal mine in the park. A vein located at the lower end of Gardiner Canyon, which was in plain view of the road but which had never been prospected, was opened up, and a tunnel run for more than 80 feet. The vein was of good size, but the quality of the coal did not warrant further work, and it was abandoned. The entrance was soon covered entirely by a rock slide.

Nearly everyone who travels through the park marvels at the great amount of wood that is going to waste, and remarks upon its value, if only near a market. While this is true, it is a remarkable fact that the cost of cutting and hauling it is so great that at our headquarters at Mammoth we find it cheaper to buy coal in the outside market, ship it in by rail, and haul it 5 miles from Gardiner, than to cut and haul the wood; therefore, practically everyone living at Mammoth uses coal and buys just enough wood for kindling. Of course, farther up in the park wood is used entirely, as it is more conveniently located to hotels and camps, and distance for hauling coal would be prohibitive.

The total amount of timber cut or gathered in the park for various purposes during the past fiscal year was as follows:

Firewood:	Cords.
For Government use—	
Cut from dead timber.....	20
Cut from green timber.....	80
Cut by Yellowstone Park Camps Co., standing and down dead timber.....	275
Cut by camps company, green timber.....	25
Cut by hotel company, green timber.....	1,559
Total for firewood.....	1,959

For building purposes by camps company, 48,100 linear feet of standing green logs varying in diameter from 5 inches to 14 inches were taken.

Cut by George Whittaker for his new general store building at the Canyon, 4,200 linear feet of standing green timber, the logs averaging 12 inches in diameter.

The following list of cases tried before the United States commissioner, Hon. John W. Meldrum, during the period from October 15, 1919, to September 30, 1920, totaling 51, speaks well for the activity and general efficiency of our park ranger force.

Cases tried before the United States Commissioner.

Date of trial.	United States versus—	Charged with—	Action taken.
1919.			
Oct. 28	Bert Gant.....	Hunting wild animals.....	Fined \$25. ¹
	Robt. Gant.....	do.....	Discharged.
	R. J. Bush.....	do.....	Fined \$25. ¹
Oct. 31	P. G. Gikerson.....	Shooting a gun.....	Fined \$50. ¹
Nov. 10	R. C. Redlich.....	Hunting wild animals.....	Fined \$25. ¹
26	Louis Larsen ²	Killing an elk.....	Fined \$50. ¹
	Harvey Halverson ²	do.....	Do. ¹

¹ Costs were assessed in addition to fine.

² Rifles forfeited to the United States.

Cases tried before the United States Commissioner—Continued.

Date of trial.	United States versus—	Charged with—	Action taken.
Nov. 13	Gilbert Egli.....	Hunting wild animals.....	Fined \$25. ¹
Dec. 1	John J. Jackson.....	do.....	Do. ¹
2	Bert Herod ²	Killing an elk.....	Fined \$100. ¹
1920.			
June 30	A. C. Green.....	Defacing formation.....	Fined \$10. ¹
	D. E. McLendon.....	do.....	do.
	W. C. Terry.....	do.....	do.
	A. B. Strode.....	Violating fishing regulations.....	Fined \$5. ¹
July 30	N. R. Laferly.....	Speeding.....	Fined \$20. ¹
2	G. L. Meyers.....	Defacing formation.....	Do. ¹
7	C. F. Schultz.....	Speeding.....	Fined \$10. ¹
16	Chas. Miller.....	Defacing formation.....	Fined \$25. ¹
16	G. S. Warren.....	Violating fishing regulations.....	Fined \$5. ¹
19	Leo Dreher.....	Defacing formation.....	Fined \$25. ¹
21	C. A. Garrett.....	Violation traffic rules.....	Do. ¹
	J. R. Mock.....	do.....	do.
24	J. C. Lamer.....	Defacing formation.....	Fined \$10. ¹
	F. Douglas.....	do.....	Do. ¹
27	G. H. Smith.....	do.....	Do. ¹
28	F. R. Eldridge.....	Violating fishing regulations.....	Fined \$25. ¹
29	R. F. Haller.....	Defacing formation.....	Do. ¹
30	L. L. Paisley.....	Speeding.....	Do. ¹
30	T. G. Sullivan.....	Defacing formation.....	Do. ¹
31	J. H. Smart.....	Leaving camp fire burning.....	Do. ¹
Aug. 2	G. H. Naughton.....	do.....	Fined \$10. ¹
3	Arthur Manden.....	Defacing formation.....	Do. ¹
5	Harold Whitaker.....	Disorderly conduct.....	Do. ¹
	Sam Moore.....	do.....	Do. ¹
	George Manger.....	do.....	Do. ¹
	Frank Zotti.....	do.....	Do. ¹
	Lucian Touchstone.....	do.....	Do. ¹
	Tom Schliche.....	do.....	Do. ¹
6	George Herringfield.....	Speeding.....	Fined \$25. ¹
7	H. Keith.....	Defacing formation.....	Fined \$20. ¹
7	M. E. Howell.....	do.....	Fined \$5. ¹
9	J. Martin.....	Speeding.....	Fined \$25. ¹
	C. Huych.....	do.....	Do. ¹
9	H. H. Kasai.....	Defacing formation.....	Reprimanded.
	Oliver Kimball.....	do.....	Fined \$40
	Margaret McKinney.....	do.....	costs: \$15 and re-
	Ida Powell.....	do.....	scinded.
10	Henry Otting.....	do.....	Fined \$10. ¹
	L. Dolsted.....	Speeding.....	Fined \$40. ¹
	Mable Fletcher.....	do.....	Fined \$20. ¹
12	F. L. Davis.....	do.....	Do. ¹
11	F. R. Lambert.....	do.....	Fined \$10. ¹
12	N. T. Smith.....	Defacing formation.....	Fined \$25. ¹
13	C. W. Dutton.....	do.....	Fined \$10. ¹
13	F. G. Smith.....	Leaving camp fire burning.....	Fined \$10. ¹
16	George Brown.....	Defacing formation.....	Do. ¹
	M. F. Cleary.....	do.....	do.
	J. C. Gilloy.....	do.....	do.
	M. O'Neill.....	do.....	Fined \$65. ¹
17	R. Linquist.....	do.....	Fined \$1. ¹
20	R. Taylor.....	do.....	Fined \$10. ¹
16	H. H. Byrd.....	Speeding.....	Fined \$20. ¹
	E. L. Beveridge.....	do.....	Fined \$25. ¹
21	O. T. Foss.....	Leaving camp fire burning.....	Fined \$10. ¹
23	O. F. Benton.....	Speeding.....	Fined \$25. ¹
31	N. Slater.....	do.....	Reprimanded.
24	H. S. Erickson.....	Defacing formation.....	Fined \$10. ¹
25	J. A. Smith.....	do.....	Fined \$20. ¹
27	A. LaBelle.....	do.....	Fined \$1. ¹
28	R. H. Matson.....	Obnoxious conduct.....	do.
	E. Huntoon.....	do.....	Fined \$75. ¹
	L. Wallis.....	do.....	do.
Sept. 9	C. A. Hamilton.....	Cutting green timber.....	Acquitted and case dismissed.
	Ernest Matherson.....	do.....	do.
	Joe Klous.....	do.....	do.
	Adolph Peters.....	do.....	do.
3	W. L. Clove.....	Speeding.....	Fined \$10. ¹
	C. O. Clove.....	do.....	Do. ¹
9	William Asplin.....	Petit larceny.....	Fined \$100. ¹
9	Fred Anholt.....	Cutting knotted trees.....	Fined \$5. ¹
	Mark Borchert.....	do.....	Do. ¹
13	J. I. Miller.....	Speeding.....	Fined \$25. ¹
14	Elias Ahuja.....	do.....	Do. ¹
20	C. A. Hamilton.....	do.....	Do. ¹

¹ Costs were assessed in addition to fine.² Rifles forfeited to the United States.

In addition to the foregoing arrests, there were four arrests for defacing formations, two for destroying Government property, two for speeding, four for leaving camp fires, and three for cutting green timber in the park. In these cases the defendants were taken to the superintendent's office and dismissed with a reprimand, it being known that the evidence was insufficient to secure conviction before the United States commissioner.

FRANCHISES AND PERMITS.

The following is a list of corporations and individuals to whom long-term franchises covering the operation of public utilities in the park have been granted:

Name.	Nature of business.	Effective date of contract.	Date of expiration.
Yellowstone Park Hotel Co....	Hotels, news stands, laundries, etc.....	Mar. 21, 1917	Mar. 20, 1937
Yellowstone Park Camps Co....	Permanent camps, news stands, laundries, etc.	Jan. 1, 1917	Dec. 31, 1936
Yellowstone Park Transportation Co.	Automobile transportation line, sale of gasoline, oil, and other automobile supplies, and para: e service.	Mar. 21, 1917	Mar. 20, 1937
Yellowstone Park Boat Co.....	Power boats, rowboats, and other transportation on Lake Yellowstone.	Feb. 7, 1913 Feb. 7, 1914	Feb. 6, 1923 Feb. 7, 1922
J. E. Haynes	Photographs, photographic supplies, guide books, etc.	Jan. 1, 1917	Dec. 31, 1936
C. A. Hamilton	(General store, gasoline, oil, etc., at Upper Geyser Basin.	Jan. 1, 1919	Dec. 31, 1928
	(General store, gasoline, oil, etc., at outlet of Lake Yellowstone.	Jan. 1, 1920	Do.
	(General store, gasoline, oil, etc., at Mammoth Hot Springs.	Mar. 13, 1913	Mar. 12, 1923
George Whittaker	(General store, gasoline, oil, etc., at Grand Canyon.	Apr. 20, 1918	Do.
Mesdames Pryor and Trischmann.	Curio shop, ice cream, and soft drinks.....	Jan. 1, 1917	Dec. 31, 1936
Henry P. Brothers	Swimming-pool baths at Upper Geyser Basin.	July 1, 1914	June 30, 1924
Robert I. McKay	Construction of metal-surfaced road connecting Gardiner and Cooke City.	Jan. 29, 1920	Jan. 28, 1940
<i>Short-term permits.</i>			
Howard Eaton, Wolf, Wyo....	Conducting camping parties through the park, using saddle and pack outfits.	Jan. 1, 1920	Dec. 31, 1930
Simon Snyder, Ishawooa, Wyo.	do.....	do.....	Do.
I. H. Larom, Valley, Wyo.....	do.....	do.....	Do.
C. C. Moore, Fort Washakie, Wyo.	do.....	do.....	Do.
Bronson C. Rumsey, Cody, Wyo.	do.....	do.....	Do.
H. G. Marvin, Cody, Wyo.....	do.....	do.....	Do.
Joe Jones, Cody, Wyo.....	do.....	do.....	Do.
Earl F. Crouch, Wapiti, Wyo.	do.....	do.....	Do.
Nels E. Soderholm, Cooke, Mont.	Hauling own employees, supplies, freight, and Government officials and employees from Gardiner, Mont., to Cooke, Mont., using one 2-ton truck, numbered 1.	do.....	Do.
Frank Lind, Gardiner, Mont..	Hauling United States mail between Gardiner and Cooke, using 1½-ton truck (also hauls express).	do.....	Do.
C. A. Hamilton	Tourists' supply station at West Thumb Station.	do.....	Do.
W. D. Marlow, Livingston, Mont.	Hauling freight (ore and supplies) between Gardiner and Cooke, using eight 3-ton trucks operated on special schedule.	do.....	Do.
Yellowstone-Western Stage Co., St. Paul, Minn.; Yellowstone, Mont.	Use of a portion of tract of land formerly leased (near western entrance) together with 7 buildings located thereon, for housing or storing personal property, including privilege of disposing of such property, and the use of a truck to remove it from the park.	do.....	Do.
Dr. W. E. Crawbuck, Yellowstone Park, Wyo.	Practice medicine and surgery, and to sell drugs and druggists' sundries in Yellowstone National Park.	July 31, 1920	July 31, 1921

MOVING-PICTURE COMPANIES.

The following-named individuals or companies operated moving-picture cameras in the park under special permits from the service:

January, 1920.—F. L. Hiscock, of Cody, Wyo., for the Fox Film Corporation, of New York City.

January and September.—A. G. Lucier, of Powell, Wyo., for the International Film Service, New York City.

January, February, and July.—Jesse G. Sill, of Portland, Oreg., for the Adventure Scenic Corporation, of Portland, Oreg.

March, April, and May.—J. A. Ramsey, representing C. L. Chester, of 120 West Forty-first Street, New York City.

July.—William L. Finley, of Portland, Oreg.

August and September.—Leland J. Burrud, of Sunset-Burrud Pictorial Co., of California.

August.—L. M. Lewis, of Minneapolis, Minn.

August and September.—Norman McClintock, of Pittsburgh, Pa.

August.—Norval McGregor, of Burbank, Calif., representing Sacred Film Co.

July and August.—Capt. F. E. Kleinschmidt, of New York City.

September.—A. C. Allen, of Medford, Oreg.

SPECIAL PARTIES.

Visit of Secretary of the Interior and Secretary of the Navy.—Secretary of the Interior, Hon. John Barton Payne, accompanied by the Secretary of the Navy, Hon. Josephus Daniels, arrived in the park on the morning of July 26 by way of the northern entrance, having motored from Helena, Mont., with United States Senator T. J. Walsh, by way of Boulder, Three Forks, and Bozeman, Mont. At Bozeman they were joined by Gov. S. V. Stewart, of Montana, and several carloads of citizens from Livingston, Big Timber, and Billings joined the party and accompanied them to the park. They made an official inspection of the park, going to Upper Geyser Basin and making a side trip to Lone Star Geyser on the 27th. On the 28th the party visited Jackson Lake, returning to the Canyon Hotel that evening. On July 29 they went to the top of Mount Washburn, lunched at Roosevelt Camp, returned through Dunraven Pass, and left on the 30th via the Cody entrance.

Visits by officials of National Park Service.—Hon. Stephen T. Mather, Director of the National Park Service, made an official inspection of the park extending from noon, August 19, to noon, August 20, entering the park via Gardiner and leaving via Cody.

Assistant Director Arno B. Cammerer visited the park officially from June 14 to 15. *Governors.*—Gov. Robert D. Carey, of Wyoming, came in at the eastern entrance on August 23, went out via the south entrance into Jackson Hole on August 25, and returned to Cody through the park, spending the night of August 28 at the Lake Hotel.

Gov. S. V. Stewart, of Montana, visited the park July 26 to 29 with Secretaries Payne and Daniels.

Gov. John J. Cornwell, of West Virginia, was here from July 26 to 30, inclusive, accompanied by ex-Gov. Henry D. Hatfield, of the same State.

Gov. L. D. Frazier, of North Dakota, entered the park at Gardiner on July 27 and spent a few days camping with his family.

Appropriations Committee tour.—The Appropriations Committee of the United States House of Representatives made an official tour of the park from July 19 to July 23. The following members of the committee were in the party: Hon. James W. Good, Iowa, chairman; Hon. William R. Wood, Indiana; Hon. Louis C. Cramton, Michigan; Hon. Burton L. French, Idaho; Hon. Joseph W. Byrnes, Tennessee; Hon. Joseph M. Evans, Montana; Hon. John J. Eagan, New Jersey; Hon. James F. Byrnes, South Carolina.

Accompanying the party were Hon. N. J. Sinnott, chairman of the Public Lands Committee; Mr. J. B. Beadle, of the Reclamation Service; and Mr. A. K. Barta, clerk of the Appropriations Committee.

The wives and friends of several members also met the party and accompanied them for at least a part of the park trip.

This committee arrived at West Yellowstone on the morning train of July 19 and proceeded that day to the Canyon Hotel by way of Norris Basin, where they remained over night. On July 20 they went to the top of Mount Washburn, arrived at Camp Roosevelt for a 1 o'clock luncheon, and proceeded in the afternoon to Mammoth Hot Springs.

The morning of July 21 was spent viewing Mammoth Hot Springs and inspecting the plants and buildings of the National Park Service and the public utilities whose headquarters are located at Mammoth. The party proceeded in the afternoon to Old Faithful Inn.

The next day part of the party visited Jackson Lake, the balance going on to the Lake Hotel, where the two groups rejoined each other late that night. Here they were met by Hon. Frank W. Mondell, Member of Congress from Wyoming and floor leader of the House of Representatives, and also by Director A. P. Davis, of the Reclamation Service, and his construction engineer. The party left the park the next morning via the east entrance.

Visits by other members of Congress.—Other members of Congress visiting the park were as follows: United States Senator C. B. Henderson, of Nevada; United States Senator Miles Poindexter, of Washington; Hon. F. C. Hicks, of New York; Hon. Hattin Sumners, of Texas; Hon. Carl W. Riddick, of Montana; Hon. Addison T. Smith, of Idaho.

Railroad officials.—The following prominent officials of the railroads which are interested in bringing tourists to the park were counted among its official visitors during the past season: Vice President H. M. Adams, Passenger Traffic Manager W. S. Basinger, and General Passenger Agent A. L. Craig, of the Union Pacific System; General Passenger Agent D. S. Spencer, of the Oregon Short Line; President J. M. Hannaford, Vice President W. T. Tyler, and Passenger Traffic Manager A. M. Cleland, of the Northern Pacific Railway Co.; Vice President C. G. Burnham, of the Chicago, Burlington & Quincy Railroad Co.; General Passenger Agent T. C. Peck, of the Salt Lake Route.

Pathfinding tour.—The official pathfinding tour, under the auspices of the National Park-to-Park Highway Association and the American Automobile Association, with the approval of the National Park Service, left Denver, Colo., on August 26, and reached the east entrance to Yellowstone Park on September 3. The leaders of the party were A. L. Westgard, of Washington, D. C.; Gus Holmes, of Cody, Wyo.; Scott Leavitt, of Great Falls, Mont.; and H. N. Burhans, of Denver, Colo.

Massachusetts Forestry Association.—Twenty-seven members of the Massachusetts Forestry Association, making their annual tour of parks and mountments, under the leadership of Mr. Harris A. Reynolds, secretary of the association, came into Gardiner on July 2 and left via Cody on July 8.

Other distinguished visitors, who are mentioned on account of their special interest in the welfare of the park, were as follows:

Brig. Gen. John A. Johnston, United States Army, who arrived on July 17, and remained until August 25.

Mr. George Horace Lorimer, editor of the Saturday Evening Post, arrived with his family via Cody on July 7 and left on July 13.

Mr. Emerson Hough, of Chicago, was here from July 6 to August 23.

Lieut. Gen. Hunter Liggett, United States Army, was here from August 2 to August 5, inclusive.

Lieut. Gen. S. B. M. Young, United States Army, retired, and Mrs. Young motored from Washington, D. C., arriving at the east entrance on July 1. Gen. Young was twice superintendent of the park.

Admiral C. McR. Winslow and Admiral Fletcher, United States Navy, spent a large part of July in the park with their families.

Mr. Hal G. Everts, writer for the Saturday Evening Post, spent several weeks of July and August in the park.

Col. Franklin D'Olier, commander of the American Legion, toured the park from August 16 to 19, inclusive.

Col. E. Lester Jones, Director of the Coast and Geodetic Survey, camped in the park with his family for 10 days, beginning August 19, and, after making the park trip, left by way of Cody on September 6.

Mr. William C. Gregg, of Hackensack, N. J., came to the park by way of Gardiner on August 8 and spent several weeks with a pack outfit exploring the southwest corner of the park. He has submitted a detailed report of this country, with a number of excellent photographs of the beautiful scenery in the Bechler and Falls River country. Mr. Gregg left the park September 26.

Mr. Robert Sterling Yard, executive secretary of the National Parks Association, spent two months in the park.

Mr. Herbert Corey, writer for numerous magazines and newspapers, entered the park on August 29 and left September 7.

Dr. George F. Kunz, president of the American Scenic and Historic Preservation Society, spent two days in the park.

Conventions.—While no conventions were held in the park, several that were held in Western States during the tourist season brought large parties of tourists to the park that otherwise might not have come. Delegates and others attending arranged their trips so that they could visit Yellowstone and other national parks, either en route to or returning from these conventions. The four most important conventions were as follows:

The Democratic national convention, held in San Francisco, Calif., the latter part of June.

The national convention of the Ancient Order of the Mystic Shrine, held in Portland, Oreg., July 4 to 7.

The national convention of the Kiwanis Club, held in Portland, Oreg., in June.

The national convention of the National Educational Association, held in Salt Lake City, Utah, in July.

Boy Scouts in the Yellowstone.—The unusual opportunities for recreation and study offered by Yellowstone National Park were utilized by the Boy Scouts of America in increasing numbers during the 1920 season. Realizing that the natural wonders of this region appeal to few classes of citizens more than to Scouts, and are understood better by none, the park administration offered the lads every facility for seeing Yellowstone thoroughly, especially those sections of it in which wild life abounds. To encourage the use of the park more and more by Boy Scouts, the park service will be ready at all times to assist in planning trips, to furnish experts who can speak to the boys on the natural history of the park, and to allow the Scouts wider latitude than usually is given tourists, because such boys have been trained to use without abusing.

Scouts from New York, Iowa, Utah, and Idaho visited the park during the year, the largest party being from Ogden, Utah. Some of the groups chose to hike the entire distance around the park; others rode between the principal points of interest, which they used as bases for expeditions into territory seldom visited by tourists, where they studied bears, porcupines, deer, wild ducks, and other animals in their native environment.

Not an accident or case of illness marred any of the trips. Many lads left the park 10 pounds heavier than when they entered, and every one learned much of outdoor life and how to meet unusual conditions. Scout Executive George A. Goates, of Ogden, declared the boys in his party of 85 learned more in the two weeks they spent in the Yellowstone than they would have learned in a year of scouting otherwise.

APPROPRIATIONS.

The appropriations made available since the date of the last report are as follows:

Act.	Purpose.	Amount.
<i>1920 fiscal year.</i>		
Nov. 4, 1919	Reimbursement of funds expended fighting fires.....	\$25,000.00
Mar. 6, 1920	do.....	4,968.05
Do.....	Reimbursement of funds expended in emergency purchase of hay for wild animals.	33,053.50
Do.....	Log crib in Elk Fork.....	3,000.00
	Total.....	71,028.64
<i>1921 fiscal year.</i>		
June 5, 1920	Administration, protection, maintenance, and improvement.....	278,000.00

The deficiency appropriations brought up the total funds made available for the 1920 fiscal year to \$328,526.64, \$255,500 having been appropriated by the act of July 19, 1919, as stated in the last annual report.

Neither the appropriations for last year nor those for the current fiscal year are adequate for the care and upkeep of this park; and until the necessary improvements have been made, I believe that the Yellowstone should receive in the neighborhood of half a million dollars annually.

REVENUES.

The revenues of Yellowstone Park are steadily increasing, and during the current fiscal year the total amount collected will approach, if not exceed, \$150,000.

The revenues for the 1920 fiscal year follow:

Sale of automobile and motor cycle permits.....	\$75,863.58
Collected from corporations and individuals operating hotels, permanent camps, the transportation line, stores, and picture shops.....	41,780.24
Sale of electric current.....	1,259.05
Sale of water.....	362.34
Miscellaneous collections.....	762.40
Total.....	120,027.61

All of these funds were deposited to the credit of miscellaneous receipts of the United States Treasury.

VITAL STATISTICS.

Births.—A baby boy, Roscoe Harold Bonnell, was born to Mr. and Mrs. Fred Lorne Bonnell, one of our mechanics, at Mammoth Hot Springs, on September 9, 1920.

Weddings.—Mr. C. A. Hamilton, who has a store franchise in the park, and Miss May Spence, of St. Paul, Minn., were married at the Yellowstone Park Chapel, at Mammoth Hot Springs, at 10.30 a. m., September 20, 1920. Residents of the park attended the wedding.

Deaths.—On April 21 Forest Ranger W. R. Johns, while returning from one of his patrols through the park and about 1½ miles inside of the park, on Hellroaring Creek, found the body of a man, the snow which covered it having melted so that a little clothing showed. Due to the severe weather, it was impracticable to move the body, and it was carefully wrapped in strong canvas and buried near the spot where it was found. The grave is located about 1½ miles inside of the park from the north boundary, on the right bank of Hellroaring Creek, and is marked with stakes at the head and foot, and the tree near by is blazed. The man apparently was a foreigner, but there was possibly no means of identification.

Mr. Jake Miller, sr., of Phoenix, Ariz., died of heart failure near the top of Sylvan Pass on June 30, 1920. He and his son, Jake Miller, jr., were making the trip through the park in a Ford car, and as the car was not pulling very well in going up the grade in Sylvan Pass, Mr. Miller, sr., decided to walk, his son going ahead with the car. When the son had gone about 200 yards he looked back and saw his father lying in the road. The old man was dead when the son reached him. Dr. Howe, of Cody, Wyo., examined the body and reported that death was due to fatty degeneration of the heart. Mr. Miller was 70 years of age and very fleshy, weighing about 215 pounds.

Mrs. Kate C. Mansfield, of New Haven, Conn., wife of Edward S. Mansfield, died on July 9 at Old Faithful Inn. She was attended by Dr. W. R. Redden, park physician, who certified that her death was the result of cerebral hemorrhage. Mrs. Mansfield was 71 years of age. Her body was shipped to New Haven.

On July 31, Miss Mary Smith, a girl of about 14, traveling with her mother and stepfather, Mr. M. Goodwin, died in the public automobile camp at Old Faithful of heart failure. An undertaker met the party at Gardiner and the body was shipped back to Fort Collins.

Mr. William Edward Myers, of Wheaton, Ill., died on August 22, 1920, at Old Faithful, of endocarditis. Mr. Myers was 43 years of age. His body was shipped to his home by an undertaker of Livingston, Mont.

ACCIDENTS.

On July 11, Mr. J. R. Alderson and his wife, son, and daughter, of Strawberry Point, Iowa, in a Buick light six car, were en route from the Canyon to Tower Falls. When they were about 5 miles from the Canyon, going uphill, the engine died. The son, R. T. Alderson, who was driving, got out to crank it, as the starter would not work. He unwittingly left it in reverse instead of neutral, and when the engine started, the car ran backwards and went over the bank and was badly wrecked. All climbed out except the mother, who sustained a badly wrenched right shoulder and some minor bruises and contusions. There were no broken bones, and at the last report the mother was recovering.

The Yellowstone Park Transportation Co.'s 10-passenger car, No. 69, loaded with tourists, left the road on a curve a little south of the 9-mile post, Mammoth toward Norris, about 2.45 the afternoon of July 18. The only person injured was J. G. Carter, 715 Adams Street, Toledo, Ohio, who sustained a fractured arm. The arm was set by Dr. T. W. Myers, of Wichita, Kans., who was traveling in another one of the transportation company's cars. The other 10 passengers in the car were interviewed, and with one exception they all spoke well of the driver. Dr. Redden was called from Mammoth and took the injured man in, and another car was sent to take the passengers to West Yellowstone. Several passengers said that Mr. Carter jumped from the car and landed against a stump.

On July 4 Dr. J. N. Stryker, of Livingston, Mont., jumped from the running board of a car and landed in front of another car which, was running close behind. The lady driving the rear car was unable to stop when the car ahead slowed down, and she ran out to the side. Dr. Stryker was quite seriously injured, several ribs being broken and his arm badly torn and lacerated.

On July 28 the Yellowstone Park Transportation Co.'s car No. 54, en route to West Yellowstone, went off the road between the Frying Pan and Norris, tipping over on its side. This was occasioned by the car meeting the transportation company's car No. 136, going in the opposite direction toward Mammoth. Nobody was seriously hurt.

On July 18 the Yellowstone Park Transportation Co.'s hired car No. 169, driven by the owner, Mr. Pelpin, left the road at a point at the 11-mile post from Old Faithful toward Thumb, striking a tree. The occupants of the car were employees of the Yellowstone Park Hotel Co. engaged in cutting wood. All of them were more or less bruised but no bones were broken. The driver claimed that he struck a soft spot in the road where the grader had been over it, throwing him off.

A Chandler car going toward Upper Basin left the road at a sharp turn at Excelsior Geyser about 3.30 a. m. on August 6, 1920, turned over twice, and landed right side up. There were six people in the car and nobody was injured beyond a few scratches. The driver was tried for speeding.

On August 18 the Yellowstone Park Transportation Co.'s car No. 111, near Madison Junction on the road from Norris, met the company's car No. 214, going toward Norris. No. 111 misjudged the speed of No. 214 and thought he had room to pass, and in attempting to avoid a rut he caused a collision. Rev. S. A. Gavin, on the left-hand rear seat of car No. 111, either had his head out of the car or was swayed out to one side and received a severe blow on the head. He was cared for at the hotel company's hospital at Mammoth until taken home by the Very Rev. E. A. Martin, O. P., of Holy Rosary Church, Minneapolis, Minn., who came for him September 3 and left September 7.

A baby Overland, four-cylinder car, owned by C. L. Huffman, of Wichita, Kans., driven by his son, left the road about a mile west of the Buffalo Farm and turned over. Mr. Huffman's shoulder was fractured.

On August 21 Henry Bayer was injured in an accident to the extent that he sustained a punctured lung and numerous abrasions about the body. Mr. Bayer was, in company with Mr. and Mrs. Ed Schulte, in a Cadillac car, 1920 Wyoming issue, No. 93; all of them residents of Casper, Wyo. The party was on the road to the Cody entrance 1½ miles east of the Lake ranger station. Mrs. Schulte was driving the car at a moderate rate of speed when the accident occurred. It was claimed by witnesses to the accident that Mrs. Schulte turned to the side of the road to allow another car to pass, which was going in the same direction, and in so doing ran off the bank, turning the car completely over. An investigation was instigated at once, and Ranger Winess reported that in his opinion the passing party was in no way responsible for the accident. The driver of the car was reprimanded. The injured man was attended, at the request of Ranger Winess, by a private doctor visiting the Lake public auto camp.

On September 21 a Buick car, driven by Mr. J. B. Ogden and carrying two passengers, ran into a tree while making a turn near the 20-mile post on the road from Lake to Sylvan Pass. The car was being driven at a high rate of speed. Mr. Ogden had four ribs broken and Miss Edith Wheeler, one of the passengers, sustained several bruises and a broken jaw, caused by the breaking of the windshield. A passing machine took the occupants of the wrecked car to Holm Lodge. The broken car was later towed into Cody.

MEDICAL SERVICE.

The contemplated permanent arrangement for furnishing medical and hospital service in the park the year around has not yet been accomplished. The Yellowstone Park Hotel Co. employed its own doctor during the tourist season, with the usual complement of nurses stationed at each hotel. The camps company also had a nurse stationed at each camp.

A temporary arrangement was made with Dr. W. E. Crawbuck, which went into effect the middle of August, whereby he furnishes medical service to Government employees, and to cover the expense each employee is assessed at the rate of \$1 a month, or \$2 if he desires to have the free service extended to his family.

CHURCH SERVICES.

The beautiful native-stone Government chapel, which was built by the War Department by special appropriation in 1912, and which has since been open for use of all denominations alike, was used regularly all winter for services by Rev. J. F. Pritchard, of Emigrant, Mont., a missionary representative of the Protestant Episcopal Church, under the direction of the Right Rev. A. W. Faber, bishop of Montana. During the tourist season both morning and evening services were held every Sunday and were well attended by both travelers and park employees.

Bishop Faber made his annual visit to this mission on July 11 and conducted services both morning and evening, and on this occasion confirmed a class of eight members.

Catholic services were held occasionally under direction of Father Blaere, of Livingston, Mont.

Christian Scientists also held services frequently.

SCHOOL AT HEADQUARTERS.

In the absence of any provision by the Government for furnishing school facilities for children whose parents reside in the park as employees of the Government or public utilities, a private school was maintained at the expense of the families benefited.

MOTION PICTURES.

Motion-picture entertainments were held in the amusement hall once a week throughout the year. During the winter these were financed by a cooperative arrangement between the park employees and the residents of Gardiner, Mont. During the summer season they were taken over and run by the Park Curio Shop.

RECOMMENDATIONS.

Most of the recommendations made in my 1919 report I want to here renew. These and the new recommendations not made last year will not by any means cover the needs of this park, but should the service be placed in a position to carry out the greater part of them the park itself would not only be tremendously benefited, but the hundreds of thousands of people or more who will visit this great playground next year and thereafter will derive a much larger measure of recreation and pleasure than the thousands who have already visited the Yellowstone. The recommendations follow:

1. More attention should be given to the private motorists. Additional public camp ground should be developed at once. These should be equipped with water systems, comfort stations, fire places, and an adequate means of garbage disposal. Camps built this year at Mammoth Hot Springs, Upper Geyser Basin, and the Grand Canyon should be further extended and improved, and new camps built at the outlet of Lake Yellowstone, the West Thumb of the lake, Tower Falls, Norris Geyser Basin, and the eastern entrance, and at other points where campers congregate in large numbers. Then smaller camps with fewer facilities should be built from time to time as needed.

2. Closely related to the development of large public camp grounds is the need of new ranger stations, particularly at Upper Geyser Basin, Lake Outlet, and the Grand Canyon, where existing stations are in a state of dilapidation and unfitted to serve present needs. These should be replaced immediately by large new stations, with a central room which can be used as a community center for campers, this room to contain an information office, a branch post office, if possible, and such other facilities as will better serve those visitors to the park who, for one reason or another, do not care to live in the hotels and camps.

3. Increased appropriations should be provided for the road system of the park. The tremendously heavy traffic to which it is now subjected is rapidly wearing out large sections of the road, and particularly those having a graveled surface. More important still, the sprinkling system must be largely rebuilt, due to the fact that it is practically worn out from long usage with a minimum of repairs.

4. A program for the gradual paving of most of the highways composing the main loop system should be adopted and progressively carried out. Under such a program those sections of the road which are hard to maintain should be bettered first, and as funds are available this work should be continued until all sections of the road not having a natural surface that is enduring and satisfactory are in the proper condition to withstand as heavy travel as the system will be likely to be subjected to.

5. The road known as the Firehole Cutoff, between Madison Junction and the Cascades of the Firehole, should be finished. It will cost about \$30,000 to finish this road. The fact that a very large sum of money has already been expended by the Army engineers is another reason why this road should be completed and opened for use.

6. A new road should be built through Lower Geyser Basin, making accessible the great Fountain Geyser, Firehole Lake, the Black Warrior, and many other interesting features. Ever since automobiles were admitted to the park the Lower Geyser Basin has been practically off the map so far as the opportunity to see its wonderful springs and geysers is concerned.

7. The road between the West Thumb of Lake Yellowstone and Bridge Bay, not far from the Lake Hotel, has excessive grades, no water with which sprinkling can be done, and is otherwise hard to maintain. This road should be abandoned as soon as possible, and a new highway constructed along the shore of the lake following the general route of the original road which was abandoned about 19 years ago.

8. The Inspiration Point Road at the Grand Canyon should be widened and protected by adequate parapets. Walks should also be constructed along this road. In order that pedestrians may not be subjected to the dangers attending the use of the road.

9. There are several sections of the Cody or eastern approach road in the park, as well as 2 miles of the southern approach road below Lewis Lake, which should be reconstructed, sharp curves eliminated, and grades bettered. Many bridges and culverts on both these approach roads should be rebuilt. Likewise, several bridges on the east approach road in the Shoshone Forest should be rebuilt.

10. By contrast with the northern entrance with its splendid arch, the eastern and western entrances appear very undignified and exceedingly ordinary. Attractive gateway structures should be built at these points.

11. At several places along the rim of the Grand Canyon, and also along the rim of the second canyon of the Yellowstone near Tower Falls on the Mount Washburn Road, and other equally dangerous places, the roads should be protected by well-built parapets, preferably of rock set in cement. It is particularly necessary that a parapet along the Grand Canyon and on Mount Washburn be erected next year.

12. The telephone system should be very greatly extended, and as soon as possible metallic circuits should be constructed to the outlet of Lake Yellowstone and to Upper Geyser Basin. If funds could be made available, the advisable thing would be to acquire the independent line of the Yellowstone Park Hotel Co., and upon a consolidation of this line with the Government line establish a first-class system that would care for all business.

13. The utmost attention must be given to the care of the elk, buffalo, and other wild animals. It is very evident that additional hay ranches must be developed at once, and the great areas of native grass now accessible in the Slough Creek Valley should be utilized. This will require the construction of ranch house, barn, and fences, as well as the purchase of machinery for cutting and handling hay. More land at the buffalo ranch should also be put under cultivation and additions made to buildings at the ranch.

14. There should be a further adjustment of grazing privileges on the national forests north of the park, to the end that more of the natural winter range of the elk may be preserved for the use of these animals when driven outside the park boundaries by storms.

15. There should be very radical changes in the Montana game laws, and I recommend that the National Park Service do everything possible to urge the delimitation of the season to a very short period, preferably two weeks, until some of the losses of last year are made up by the natural increase. The 75-day season now authorized by the laws is indefensible from any standpoint.

16. More funds must be provided for the buildings and grounds at headquarters. Within two years it will be necessary to paint most of the buildings of the old Fort Yellowstone, a valuable plant that should not under any circumstances be allowed to deteriorate.

17. New trails should be built, particularly for the purpose of affording better fire protection. Wherever possible existing trails should be marked and improved. It is particularly desirable that the trail system paralleling the roads be completed, and also that a trail be built from Heart Lake across the arms of Lake Yellowstone to the Yellowstone River.

18. All irrigation projects, worthy as well as unworthy ones, should be given no consideration under any circumstances. No irrigation projects involving the waters of Yellowstone Park that have been discussed need be constructed within the park boundaries, because there are adequate sites for the storage of these waters outside of the park.

19. After a careful consideration of all the problems of the park, I am convinced that, with the exception of the Firehole Cutoff Road, the proposed highway through Lower Geyser Basin, the rehabilitation of the old road along the shore of Lake Yellowstone between West Thumb and the outlet of the lake, and the improvement of the road in the park connecting with the West Gallatin Road, no other highways should be built in Yellowstone Park, now or hereafter.

20. It would be most advantageous to the park if the legislation providing for the extension of the park to include the headwaters of the Yellowstone and the Teton Mountain region should be enacted into law. My recommendation regarding the construction of no more new roads would also extend to the area involved in the proposed enlargement. However, the main highway across this area, now under the jurisdiction of the park service, should be further improved and always kept in first-class condition.

In my opinion, also, the territory at the headwaters of the Lamar River, east of the park, including the valleys of Cache, Calfee, and Miller Creeks, as well as the Lamar River itself, should be added to the park, in order that the eastern boundary may better conform to the topography of the country.

21. The hotels, camps, and transportation line should all be required to expand their facilities as fast as possible, in order that they may accommodate the ever-increasing throngs of visitors. It is particularly necessary that some of the hotels be enlarged by the addition of more sleeping rooms and extensions of the dining rooms. More cars for side trips must be kept hereafter at the main points of interest.

22. A careful study must be made of sanitary problems at Mammoth Hot Springs, Upper Geyser Basin, Lake Outlet, and the Grand Canyon. This survey should be made by the United States Public Health Service and should be comprehensive, extending, if possible, over the entire season, in order that conditions early and late, and at the height of the season, may be observed by the engineer. It is probable that sewer systems will have to be established in the early future at each of the main points of interest, and as the public utilities of the park will have so many extensions of their own to finance, these systems are likely to become a charge upon the Federal Government.

23. Finally, it is recommended that, if possible, authority be secured from Congress for the use of Yellowstone Park appropriations immediately upon the enactment of the sundry civil bill. Under such a plan a tremendous saving in the purchase of supplies and the initiation of improvement work could be effected, and in many other directions the operation of the park could be conducted more economically and efficiently, and with greater benefit to the people of the Nation who use the park. Likewise, it would be a most desirable thing if the revenues of the park could be expended in the maintenance and improvement of its roads and trails.

YOSEMITE NATIONAL PARK.

W. B. LEWIS, Superintendent, Yosemite, Calif.

GENERAL STATEMENT.

The Yosemite National Park, when created by the act of October 1, 1890 (26 Stat. 650), was situated in Tuolumne, Mariposa, Madera, and Mono Counties, Calif., and covered an area of about 1,512 square miles, being 36 miles wide by about 40 miles long. Under the act approved February 7, 1905, entitled "An act to exclude from the Yosemite National Park, Calif., certain lands therein described and to attach and include the said lands in the Sierra Forest Reserve," 542.88 square miles were excluded and 113.62 square miles were added to the park, making a net reduction in area of 429.26 square miles, so that the area, after the passage of the above act, was 1,082.74 square miles, the park being situated in Tuolumne, Mariposa, and Madera Counties. By act of June 11, 1906, entitled "Joint resolution accepting the recession by the State of California of the Yosemite Valley grant and the Mariposa Big Tree Grove, and including the same, together with the fractional sections 5 and 6, township 5 south, range 22 east, Mount Diablo meridian, Calif., within the metes and bounds of the Yosemite National Park, and changing the boundaries thereof," there were added to the park the Yosemite Valley, 48.60 square miles; Mariposa Big Tree Grove, 4 square miles; and a strip lying between the latter and the park proper, 2.13 square miles; and deducted by the change in the southwestern boundary, 13.06 square miles; making a net addition to the area of 41.67 square miles. The present area of the park is 1,124.41 square miles.

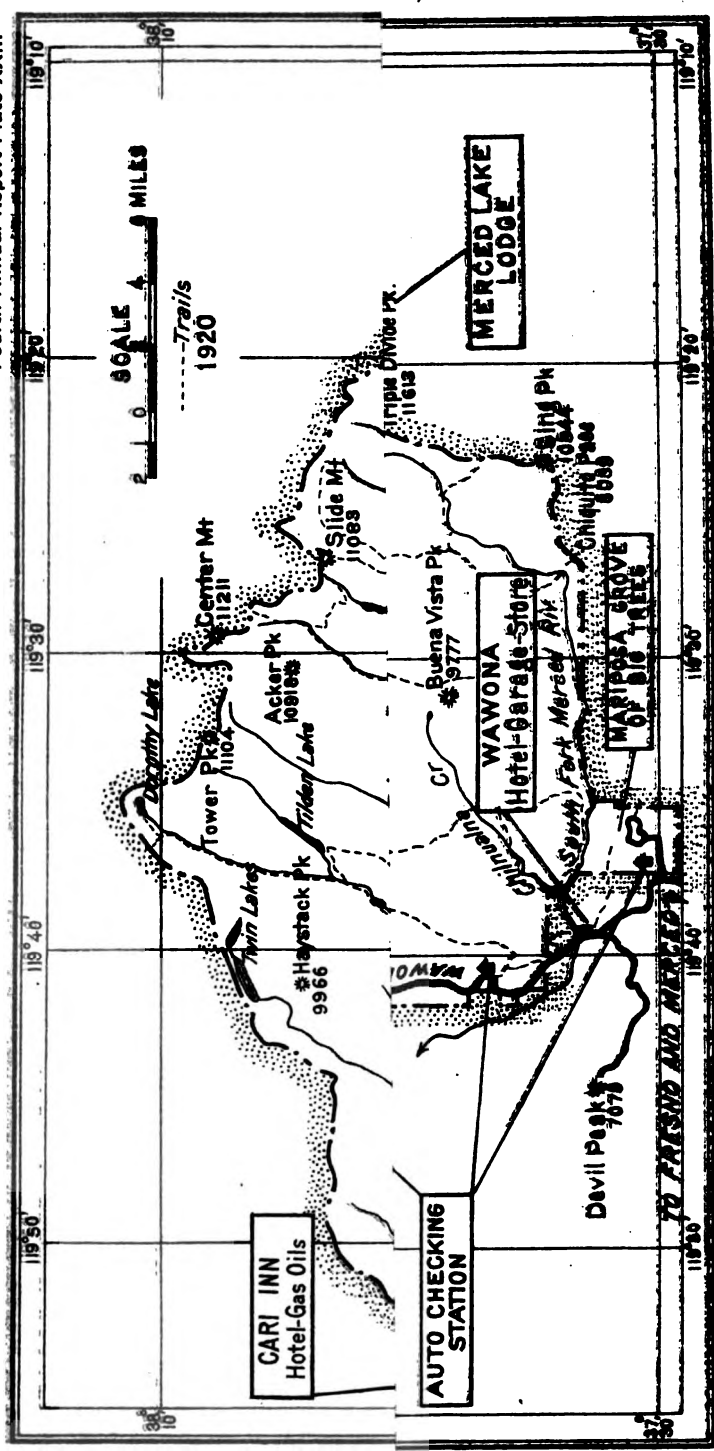
ADMINISTRATION OF THE PARK.

With the increasing travel from year to year, especially motor travel, the extension of activities of the park operators along various lines to meet the growing demand for accommodations and other facilities and the consequent extension of Government activities, the matter of organization of the park forces to best meet the conditions has been the subject of considerable thought during the year.

Gradually expanding for years past, the work of administering and protecting the park, maintaining its roads and trails, its buildings and camp grounds, operating and keeping up such public utilities as are handled by the service, etc., has now reached that awkward point where departmental units are essential, but where care must be taken to avoid overorganization. With this in view, during the past winter an organization chart was prepared dividing the park force into seven departments, each with its supervising officer and with the activities and duties of each as clearly specified as practical and economical operation will permit. These various administrative and operative units together with the general activities of each are enumerated below.

GENERAL ADMINISTRATION.

Assistant superintendent in charge. General office management, purchase of all supplies and equipment, disbursing of pay rolls and accounts, time keeping, accounting,



MAPS AND PRINTED BY THE GEOLOGICAL SURVEY

MAP OF YOSEMITE NATIONAL PARK

collection and transmission of revenue, appointments, employees' compensation, preparation of contracts and vouchers, and the numerous details of routine matters.

MAINTENANCE AND OPERATION.

Park supervisor in charge. Maintenance of roads, trails, fences, bridges, buildings, water and sewer systems; care and distribution of stock and transportation facilities; upkeep and repair of tools and equipment; care of public camps and grounds; disposal of garbage and waste; and the production of wood, ice, hay, etc.

ENGINEERING.

Resident engineer in charge. Advisory supervision of all outside maintenance work; making of surveys; preparation of plans, designs, and specifications for construction; inspection of contract work; and general supervision of construction.

RANGER SERVICE.

Chief park ranger in charge. Fire control, information to the public, checking of automobiles, issuing of automobile permits, control of firearms, game protection and distribution of fish and game, general police work, and enforcement of park regulations.

ELECTRICAL DEPARTMENT.

Chief electrician in charge. Maintenance and operation of power plant and telephone and telegraph system; construction of telephone, telegraph, and transmission lines; and installation and maintenance of all electrical equipment.

MECHANICAL DEPARTMENT.

Master mechanic in charge. Repair and maintenance of all motor-driven vehicles and power-driven machinery.

FORESTS AND TIMBER.

Park forester in charge. Supervision of all timber operations in the park and the immediate representation of the Government on the Hetch Hetchy water and power project in course of development by the city and county of San Francisco.

The effectiveness of this distribution of duties to the more or less well-defined units is dependent, of course, on the amount of cooperation between the various departments, and to date it is working out satisfactory in that respect, and there is every reason to believe it will continue to do so.

POLICING AND PROTECTION OF THE PARK.

Policing and protection of the park is the principal function of the ranger service. Ordinarily the force consists of one chief ranger, one assistant chief ranger, and eight rangers employed under permanent appointments. During the travel season the force is augmented by the addition of 12 or 15 temporary rangers for the purpose of checking automobiles and giving additional police and fire protection.

The season covered by this report has been undoubtedly the most trying one for the ranger force in the history of the park. Prior to July 1, shortage of funds made necessary the curtailment of expenditures in this department as well as in all others, with the result that it was impossible to increase the force during the busiest part of the season. With but 10 men, 2 of whom were on the inactive list part of the time as a result of accident and sickness, the extraordinarily heavy travel of May and June was most efficiently handled. This meant "on duty" day and night, but not once was there a grumble nor was there at any time a spirit displayed other than that of an effort to meet the situation in the most cheerful and efficient manner. I can not commend too highly the work done and the fine spirit displayed by the force during this period and during that which followed when, even with funds available, it was so difficult to secure satisfactory men for temporary duty.

FEDERAL JURISDICTION.

On June 2, 1920, the President signed the bill accepting exclusive Federal jurisdiction of the park as ceded by the State of California in an act signed by the governor of California in April, 1919. By the terms of these acts jurisdiction of all felonies and misdemeanors as well as violations of the rules and regulations of the park are vested in the Federal Government. A resident United States commissioner is authorized in such cases to impose penalties in the nature of fines not exceeding \$500 or imprisonments of periods not longer than six months, or both.

Mr. C. A. Degnan, of Yosemite, Calif., was appointed to the post of United States commissioner in June, the appointment becoming effective July 1, at which time the law became operative.

This combination of Federal jurisdiction with the already existing Federal administration can not help but work for a more satisfactory enforcement of park regulations and relief from the many embarrassments suffered through lack of the proper means under the former conditions of mixed jurisdiction.

For the more effective operation of the law, steps are being taken to secure appointment of at least one of the park ranger force as United States deputy marshal.

HOTEL AND CAMP ACCOMMODATIONS.

While hotel and camp accommodations, both within Yosemite Valley and elsewhere in the park, are extensive, there is still much room for further extension and development. It seems particularly necessary that additional accommodations be provided in the valley with the least possible delay to take care of the midseason demand, and that

the existing Sentinel Hotel, with its total lack of comforts and conveniences, be replaced with a modern structure adequate to meet not only the demand for a higher class of accommodations than the camps and lodges offer but also to meet the demand for winter travel.

All of the existing hotels, camps, and lodges are operated on the American plan and offer accommodations as follows:

Sentinel Hotel, located in Yosemite Valley, has, including its four disconnected cottages, a capacity of approximately 100 guests and provides rooms with or without connected baths. The buildings, erected from 40 to 50 years ago, of flimsy construction for summer occupation only, are not adaptable to modern hotel wants in spite of the very considerable remodeling that has been done during recent years.

Camp Curry, located near the upper end of the valley, has a very extensive central operating unit of permanent buildings consisting of office, dining room and kitchen, steam laundry, studio, bowling alleys, pool and billiard room, dance pavilion, post office, swimming pool, etc. The accommodations are of two classes, tents without bath and bungalow tents with bath. The camp has a capacity of about 1,100 guests and is filled to overflowing during the peak of the travel season.

A distinguishing feature of Camp Curry is its complete electric-cooking installation. With one of the largest, if not the largest, electro-cooking installations in the State, practically all of the cooking and baking for the camp's guests, reaching at times as many as 1,100, is done by this most modern and sanitary means.

Its unquestionable success here, together with the increasing cost and growing scarcity of fuel oil, is influencing electrical cooking installation in all other hotels and lodges in the valley.

Yosemite Lodge, situated near the foot of Yosemite Falls, has a capacity at present of 800 guests. The lodge offers three classes of accommodations, wooden bungalows with bath, wooden bungalows without bath, and tent bungalows without bath. In addition to its central operating unit of rather temporary buildings, it has an excellent swimming pool surrounded by well-appointed bathhouses and operates a large up-to-date steam laundry.

In addition to the above, there is operated in connection with the Yosemite Lodge, but as a separate unit, Camp Tecoya, for the accommodation of the employees of the Yosemite National Park Co. Camp Tecoya has tent sleeping quarters, its own kitchen and dining room unit, the latter being operated on the cafeteria plan. The camp has a capacity of approximately 400 employees.

A house-keeping camp is also maintained by the Yosemite National Park Co. for the accommodation of its married employees and their families. This is located on the site of what was originally the public automobile camp No. 17, and has a capacity of about 50 families.

Free public camps.—Fully as important as any of the above-mentioned hotel and camp facilities, if not more so, are the free public camping grounds maintained by the service on the floor of the Yosemite Valley. Eleven of these camps are maintained, covering about 1 square mile of area. They have a total capacity of perhaps 4,000 people, even allowing abundant space to everyone. All are provided with the necessary sanitary provisions, which are supervised and cared for by the service, and are for the most part provided with running water, all without expense to the user.

The popularity of these camping facilities is attested by the fact that more than 25,000 people made use of them during the season of 1920. This represents some 35 per cent of the total visitors to the park, and an increase of about 7,000 over the number utilizing the public camps during the previous year. For a period of two months the average daily population of those camping was not far from if not fully 2,000, while the maximum was reached on July 4, when 2,956 campers were being accommodated at one time.

Glacier Point Hotel.—This modern and attractive hotel, situated at Glacier Point, on the very rim of the valley, offers first-class accommodations throughout, and has a capacity of about 140 guests. It is supplemented in a small way by tent accommodations at more moderate prices than the hotel can afford to make.

Merced Lake Lodge.—The lodge is situated on the shore of Merced Lake, in the upper Merced River Canyon. Canvas buildings are used for kitchen and dining room and for housing the hot and cold shower baths which the lodge supplies, while three-room bungalow tents are furnished for sleeping quarters. The lodge has a capacity of 60 guests.

Tenaya Lake Lodge.—The Tenaya Lake Lodge is located on the shore of Tenaya Lake on the Tioga Road. Its equipment is the same as that of the Merced Lake Lodge, and it has a capacity of about 80 guests.

Each year shows improvement in all of the above facilities, both in accommodations and service. This has been particularly noticeable during the season just passed when, in spite of the greater travel to the park and the consequent greater use of these facilities, fewer complaints have been rendered than during any previous year since I have been in charge of the park.

That uniformly good service was maintained throughout the season speaks well for the operators of the various hotels, camps, and lodges, as they faced a help shortage probably unequaled even during the war.

TRANSPORTATION FACILITIES.

Automobile transportation into and within the park has shown a very decided increase over that of any previous year. The Yosemite National Park Co. operated a fleet of 45 ten and twenty passenger busses and seven-passenger touring cars connecting with the twice-daily train service at El Portal, on daily trips to Glacier Point, Mariposa Grove, and Hetch Hetchy, and semiweekly trips to Lake Tahoe. A jitney service was also maintained between hotel, camps, and lodges, and between these and the foot of each of the trails to Glacier Point.

The Yosemite Stage & Turnpike Co. operated a fleet of 16 eight-passenger cars on daily schedules between Merced and the Mariposa Grove of Big Trees, Wawona, Glacier Point, and Yosemite.

While there was a short period during the latter days of June and the first days of July when the demand could not be fully met, on the whole the service was very satisfactorily handled and with little cause for complaint. In fact, considering the conditions under which this service is operated, it seems to me remarkable that it has been so satisfactory as it has. I refer to road conditions in general, and in particular to those obtaining outside of Yosemite Valley. These roads are not adapted to automobile traffic, and annually after the dry season has been on for a few weeks no amount of repair work will prevent them from literally going to pieces, which they do. The result is a wear and tear on motor equipment that is discouraging to say the least to the operators, to say nothing of the effect of jolting and jostling suffered by the passengers.

I wish here to express my appreciation of the manner in which the service has been supported by the operators in regulating speed and carefulness of stage drivers. They have made it much more a point than ever before of insisting upon careful driving, and on all occasions where drivers were found guilty of recklessness or carelessness in this respect they have been discharged forthwith without question and on most occasions without waiting for suggestion from us.

RECREATIONAL OPPORTUNITIES.

Yosemite is probably unequaled, certainly unexcelled, in opportunities for wholesome outdoor recreation, and it is a real pleasure to see each in his or her own way seeking to make the most of them. A trip through the public camps, along the trails, over the roads, or along any of the many trout streams can not be but a revelation to the easterner or the person who has spent his life in the city. Here is a camp consisting of only a bed roll and the very essentials of a cooking outfit, while possibly next door is one containing everything from spring mattresses to real silverware on the table; all the comforts of home in the good outdoors. At one place along the river bank or on the shore of a mountain lake, bathers, young and old, are succeeding in convincing themselves that the water is "just right," while further along a fisherman patiently and untrilingly seeks to induce a wily trout to partake of his lifeless fly. Out on the mountain road the hiker with his camp outfit on his back meets the collapsible "Tin Lizzie," loaded with all seven members of the family and decorated with what appears to be sufficient culinary equipment for a small army, and also the seven-passenger limousine with its two occupants and their "luggage" only. They are all going to the mountains each to enjoy himself in his own way. The result achieved by each is the same, irrespective of the manner in which it was accomplished. They become acquainted, each with a fuller appreciation of what the Nation holds in trust for them.

As true contentment can only be recognized by comparison, the picture would not be complete without the grouch. He is there, but not in sufficient impressiveness to spoil the pleasure of all others as he would wish. He is the one that condemns the Government because he must keep his camp clean; because he is not permitted to destroy the flowers so others can not enjoy them; because he can not catch and waste all the fish in the streams; who does not realize that his mental condition is simply the result of pure selfishness and inconsideration for others. But even he has been known to join with the others and actually obtain enjoyment in the outdoor life, although more by instinct than by reason.

The policy of the service in making provision for each and every class by developing all sorts of accommodations from the free public camp to the first-class hotel is a healthy one that public opinion is going to continue to support.

SCHOOL FACILITIES.

Yosemite Valley falls within the Yosemite school district; in fact, the entire district is within the park boundaries. There are some 15 or 20 children, principally of Government employees, of school age and for whom school facilities must be provided throughout the school year. In addition to these, who attend regularly, there are others of the families of employees of the various park operators as well as of temporary employees of the service who take advantage of the school during the spring and autumn months.

The Yosemite school is a modern building, electrically lighted and heated, built under a \$10,000 bond issue in 1917. At present, grammar grades only are taught, but the carrying of high-school courses is under consideration for the benefit of those living in the valley who have reached high-school age and who are now forced to continue their schooling outside at considerable additional expense.

CHURCH FACILITIES.

In the early eighties the Associated Sunday Schools of California, with funds raised from subscriptions from the Sunday-school children throughout the State, erected a small church about halfway between the Sentinel Hotel and Camp Curry. This was later moved to its present site in Yosemite Village. The church is nonsectarian and available for services by all. During the tourist season services, both Protestant and Catholic, are held with more or less regularity, depending upon the availability of volunteer pastors or priests.

ROAD SYSTEM.

The road system of the park consists of approximately 1 mile of bituminous-bound macadam, 3 miles of water-bound macadam, 17 miles of gravel, 102 miles of crude mountain road without surfacing other than the natural soil, 8 miles of well-graded highway, unsurfaced, and 7 miles of ungraded and unsurfaced roads through the public camps, a grand total of approximately 138 miles. The improved roads, totaling 29 miles in all, are confined to the floor of Yosemite Valley and the El Portal Road, the grading of which was practically completed during the past year. From \$30,000 to \$60,000 are spent annually on the upkeep of the system, about 50 per cent of which is for sprinkling on the floor of the valley and on the El Portal Road, and 20 per cent for the maintenance of these roads, the total amount so expended, and the result

manifested in road conditions, depending upon the amount of money available for allotment to this purpose.

While, during the average year, it is possible to maintain the Valley and El Portal Roads in fairly good condition throughout the year, no permanent improvement is accomplished and each year is faced the problem of largely repeating the work done the previous year. On the mountain sections, in addition to being unable to accomplish any permanent improvement, there is not even the satisfaction of maintaining fair traffic conditions. In fact, on the latter sections annually, before the travel season is half completed, conditions obtain that can not be described other than as atrocious. Constant wear and tear have developed chuck holes ruinous to motor vehicles, the surface lies inches deep in dust, and the unsuspecting motorist is subjected to a treatment of twisting and jolting that calls forth the severest criticism of the service and the Federal Government, in general, and those in direct charge, in particular.

The entrance during the past season of some 70,000 people, 70 per cent or more of which came in their own automobiles, is convincing evidence that there is a healthy desire to see and enjoy the wonders of the park by motor. They are for the most part appreciative of the park, and it does not seem fair that these people should have to be subjected to such severe maltreatment in order to take advantage of what the park offers in the way of recreational and educational advantages. The "good-roads idea" has taken so solid a hold on the minds of the motoring public that unless something is soon done in the way of permanent improvement on roads into and within, not only this but all national parks, interest in our national playgrounds is going to wane to the point where they are likely to be avoided to some extent rather than sought.

It is estimated that to put the 138 miles of road in the park in the proper condition to meet the demands of traffic the expenditure of about three and one-quarter millions of dollars would be necessary. At first thought this might appear like a prohibitive and unreasonably excessive sum to demand of the people of the United States in these days of the high cost of living (and the cost of high living), but, when it is considered that this would represent a tax of only 3 cents for each of the 110,000,000 people in the country, the burden that would be imposed could not be considered as presaging national financial calamity.

In fact, the tax that would have to be borne per capita were the total amount exacted from the people actually visiting the park would not be particularly appalling if spread over a number of years. Considering five years as a reasonable period in which to expend this amount—and it could not be expended economically and to the best advantage in a shorter period—and reckoning that the average annual attendance would be at least as great as that of the past season, namely, 70,000 people, each visitor's pocketbook would be reduced by only \$10. That this would not be unreasonable, but would be rather a saving to each, particularly the motorist, may be shown, and the following figures might be of interest in this respect.

The statement has frequently been made by motorists that one trip over the Yosemite roads represents a depreciation of not less than \$200 to the automobile making it that could be saved were proper roads existent. I have heard this statement made as a conservative estimate. In the interest of conservatism, however, let us put it at one-half that, or \$100, and the resulting conclusion is still spectacular. During the year covered by this report, in round numbers, 15,000 automobiles entered the park. On the above basis these cars suffered depreciation to the amount of \$1,500,000. Figuring the average load carried as 3.5, the per capita loss for the one season as a result of bad-road conditions reached the astounding figure of \$28.56 per person, or nearly three times as much as would be the case were a flat charge of \$10 per capita made. It would logically seem, therefore, that the motorist in worrying along with present conditions is bearing a burden far in excess of what would be required were he taxed directly to rectify the condition, and that accordingly the Government might be excused of these charges of undue exaction from the people were the necessary funds appropriated.

TRAIL SYSTEM.

The Yosemite Park trail system consists of approximately 615 miles of trails. While it has always been possible to maintain those trails in the southern part of the park in from fair to excellent condition, lack of sufficient funds and inability to secure labor has made even ordinary repairs to those to the north of the Tuolumne River impracticable during the past several years. This fact, together with destructive results of grazing during the war, has resulted in these trails reaching a state of dilapidation, and in places they have become almost impassable. Crews were, however, finally recruited in August of the season just passed, and all of the trunk line trails in this area were put in a good state of repair. At the present time the entire park trail system is in better shape than at any time for years past.

BUILDINGS.

No new buildings were erected by the service during the year other than the laborers' mess house, which was built near, and forms a part of, the main operating unit, consisting of shops, barns, etc. The mess house was built for the most part of salvage material, and is capable of handling 200 men.

ELECTRICAL SYSTEM.

The park electrical system consists of a diversion dam across the Merced River about 1 mile below the Phono Bridge, from where the water is carried in a 54-inch redwood-stave pipe 6,000 feet in length to a power house containing two electrical units of 1,000-kilowatt capacity, each driven by turbines operating under a head of 830 feet. Electrical energy developed is carried to the various points of distribution in Yosemite and at Glacier Point on some 20 miles of transmission lines, of which 7 miles carry 11,000 volts and the remainder 2,200 volts.

During the year ending June 30, 1920, the plant, operating 24 hours daily, developed a total output of 1,212,410 kilowatt hours, the distribution and utilization of which, as well as a comparison with last year, is shown in the following table.

	Kilowatt hours, 1919.	Kilowatt hours, 1920.	Increase, per cent.
Sold for lighting purposes.....	85,412	126,548	48.0
Sold for heating purposes.....	72,611	138,323	90.5
Sold for cooking purposes.....	121,641	224,175	84.4
Sold for power purposes.....	37,194	51,967	39.7
Total sold.....	316,385	541,013	67.5
Used by service, including line losses.....	549,265	671,397	22.2
Total output of plant.....	866,123	1,212,410	40.0

The average income per kilowatt hour sold was \$0.023, while the total income was \$12,288.78, and with a total expenditure of \$15,928.07, the average cost of production per kilowatt hour was \$0.013.

Since the substitution of steel for one of the original concrete elbows in the pipe line last autumn, no difficulty has been experienced in the operation of the plant, which is giving complete satisfaction.

TELEPHONE AND TELEGRAPH SYSTEM.

The telephone system consists of a 150-line switchboard and approximately 225 miles of telephone circuits, 120 miles of which are metallic circuits, the remainder being single-wire grounded circuits to which a maximum of 136 telephones were connected during the year.

The telegraph system consists of 15 miles of No. 6 copper wire metallic line between El Portal and Yosemite and 1 mile of No. 9 iron metallic circuit between Yosemite and Camp Curry, a main station at headquarters, and a branch station at Camp Curry. The telegraph lines above mentioned are also used for telephone circuits and are included in the total mileage as given for the telephone system.

Local and long-distance service is maintained through the telephone exchange on a 24-hour basis throughout the year, while during the heavy travel season, a 16-hour service is maintained in the main telegraph office and an 8-hour service at Camp Curry. Two operators are employed in the main telegraph office and one at the Camp Curry branch.

The following table shows the business handled both by telephone and telegraph during the year ending June 30, 1920, as well as a comparison with that handled during the preceding 12 months:

	1919	1920	Per cent increase.
Local telephone calls.....	134,297	175,741	30.8
Long-distance calls.....	2,753	3,286	19.3
Telegrams through telephone exchange.....	888	697	127.7
Telegrams by Morse key.....	8,735	10,992	25.8
Total messages, all classes.....	146,663	190,716	30.0

¹ Decrease.

WATER SYSTEM.

Aside from the replacement of the 4-inch main from Yosemite Creek Bridge to Yosemite Lodge by an 8-inch line, no change was made in the water system during the past year.

The system consists of two concrete reservoirs in which is collected spring water from the talus slopes directly beneath Glacier Point, near Happy Isles, and from where the supply is conducted down the Valley past Camp Curry to the village and Yosemite Lodge in an 8-inch cast-iron main. As the spring supply becomes insufficient to meet the demand before the season is more than one-half over, the very considerably inferior river-water supply is turned into the main which is connected to the pressure pipe of the old power house at Happy Isles. Not only is this unsatisfactory from point of quality of the water, but the increasing demands continually being made upon the system through the extension of activities of the park operators, as well as ourselves, even the much greater head thereby produced, the head is not sufficient to force enough water through the mains to maintain anything like a satisfactory pressure at the units served. For example, with the river turned in, the normal night pressure in the village is about 75 pounds, while during the day when the demand is heavy it falls as low as 20. In case of fire this would be exceedingly serious. At the same time, at the Government shops and barns, at Camp Tecoya, and army row cottages, it is not infrequent that for short periods the mains will not deliver any water whatsoever.

To improve the condition, not only should an entirely new supply be developed with the quality of the present inadequate spring supply and the head of the unsatisfactory river supply, such as that afforded by Illi-flouette Creek, but the present 8-inch main should be supplemented by another one of the same carrying capacity. Not until this is done can the valley be assured of a satisfactory domestic supply or adequate fire protection.

SEWERAGE AND SANITATION.

Additional demands upon the already overloaded, makeshift sewage disposal units of Camp Curry, Yosemite Lodge, the village, and the Glacier Point Hotel brought about a more horrible soil and river pollution condition than was experienced even in the previous year when the study and report of the United States Public Health Service showed so clearly how, by failing to improve sewerage facilities, the public health of the valley was being seriously endangered.

It is gratifying to know, however, that such conditions will not obtain another season, Congress having authorized the expenditure necessary for the installation of a complete sewage-disposal plant for Yosemite Valley. The new system will consist of some 4 miles of main sewer line and probably half as many miles of laterals, a reinforced concrete settling tank of the two-story type, sludge tanks, sprinkling filters, and sand filtration beds. Connection with all camp, hotel, and industrial units will be provided for, and the plans contemplate the installation of units of flush toilets, slop hoppers, and possibly shower baths in the various public camps.

Work on the installation of the new system was begun in the month of August when the preparation of plans and specifications were started by Galloway & Markwart, civil engineers, of San Francisco. The work is being pushed vigorously at this writing, and the installation should be complete by opening of the next tourist season.

The work of policing the public camping grounds and the removal and disposition of garbage and the handling of the general sanitary condition was handled by a force of from one to seven men and one to two two-horse teams and wagons as occasion demanded. In spite of the extraordinary popularity of the public camping grounds, as attested by the fact that more than 25,000 people were there accommodated during the season, the situation was very effectively cared for.

While the present method of disposing of garbage by hauling well down the valley and burning in open pits is relatively satisfactory, in the interest of economy the installation of a garbage incinerator is something that should be done in the near future.

The very unsatisfactory condition existing at Glacier Point for years back as a result of ineffective and inadequate means of sewage disposal has been relieved by the installation of a practical and efficient system. The sewage is now disposed of on the north side of the hotel, thereby ending possible pollution of the stream which flows along the Ledge Trail and which has heretofore been banned for drinking purposes for the thousands of people who annually travel it.

WEATHER STATIONS.

Two volunteer weather stations are maintained in the park, one at the office of the superintendent and one at Glacier Point, the latter having been installed during the past winter. Each station is supplied with a maximum and a minimum thermometer in standard shelters, a rain gauge, and a snow gauge. The equipment is furnished by the United States Weather Bureau, to whom monthly reports are made. Observations are taken daily.

MEDICAL SERVICE.

The Yosemite medical service continued under the direction of Dr. Frederick L. Stein, assisted during the main tourist season by Dr. E. A. Reit, of the Hooper Institute of San Francisco, and Dr. M. Sutter, of the University Hospital, San Francisco, Calif.

That there were complaints goes without saying, but upon investigation it either developed into the impossibility of trying to fix responsibility with nothing more to work on than the absolutely conflicting statements of two persons, or the pitting of the layman's judgment on medical treatment against that of the professional. In the former cases arbitration, as always in such cases, was hopeless, while in the latter it was assumed that the judgment of the professional man was more nearly correct and should govern, and considering everything there is no reason to believe that the assumption was wrong.

It is not meant to infer that these complaints and criticisms were numerous, for, as a matter of fact, considering the number of cases handled, they were amazingly few, and I will say that words of commendation of the service greatly outweighed the adverse criticisms, and it is not at all unusual to hear expressions of surprise at the completeness of equipment and the high standard of medical and hospital service afforded in a place so comparatively isolated as is the park.

The following figures compiled for the year ending June 30, 1920, give a general idea of the activities of the service:

Office treatments and examinations.....	3,406
House calls.....	1,448
Hospital cases.....	81
Accidents reported.....	192
Operations (minor) performed.....	47
Operations (major) performed.....	7
Deaths reported.....	3
Births attended.....	6

ACCIDENTS.

Of the 192 accidents reported, only 2 were of a particularly serious nature. The first of these was suffered by Mr. N. Hayetas, an employee of the Yosemite National Park Co., on September 10, 1919, when his right arm was broken by a fall from a horse. The other by Park Ranger Ansel F. Hall when, on May 26, 1920, while on motor-cycle patrol duty, he sustained a fall resulting in a compound fracture of the right leg.

VITAL STATISTICS.

Births.—The following births occurred in the park during the fiscal year:

August 29, 1919, Harry Marion Lowrie.
October 15, 1919, Albert Leopold Malcolm Jones.

April 4, 1920, Leroy Jesse Rust.
 May 30, 1920, Dorothy Jean Gallison.
 July 11, 1920, Johann Ferdinand Tribukait.
 July 25, 1920, Loya Louette Bryant.

Deaths.—On August 7, 1919, John Moore, a laborer employed by the Yosemite Lumber Co., was instantly killed by being struck by a falling gin, or loading pole.

On July 7, 1920, Gertrude Kistler, of Lock Haven, Pa., was killed, due to accidental drowning in rapids of Merced River.

On July 7, 1920, Herbert J. Pink, of Los Angeles, Calif., was killed, due to accidental drowning in rapids of Merced River.

On October 15, 1919, Chas. Dick, Jr., an Indian, and son of Chas. Dick, a Government employee, died of tuberculosis, at the Cascades.

On April 25, 1920, J. Serrano, a laborer employed by the Utah Construction Co., building the Hetch Hetchy Dam, was instantly killed by a falling rock.

On May 3, 1920, D. O. Robinson, assistant superintendent of construction for the Utah Construction Co., was struck by a cable and fatally injured, dying on the following day.

INSECT CONTROL.

Shortage of funds for the purpose prevented a continuation of general insect control work as carried on in previous years. A few trees were, however, felled and treated on the floor of Yosemite Valley, all yellow pines attacked by the western pine beetle.

The very effective treatment of former years has left the yellow, sugar, and Jeffrey pine areas in such a satisfactory condition that the past year's neglect has not been noticeably detrimental, these areas remaining apparently fairly free of infestation. This neglect should, however, not continue, lest infestation, which is continually in evidence, get beyond economical control.

The effect of infestation of the lodgepole pine belts along the Tioga road continues to spread slowly, and it is to be hoped that a continuation of study here by the Bureau of Entomology will result in an effective and, at the same time, economical means of control being devised. Otherwise the magnificent forests of these areas are doomed to extermination, similar to that suffered by the lodgepole forests around Tenaya Lake.

MOSQUITO CONTROL.

In March, rather earlier than usual, mosquito breeding started in the pools on the floor of Yosemite Valley. Control measures were immediately undertaken, and from that date to the end of the breeding season, late June, breeding was checked as fast as it appeared, by the spraying of oil.

The work was done under the immediate direction of Park Ranger Charles F. Adair and under the general supervision of Maj. J. C. Gelger, detailed by the United States Public Health Service for that purpose.

The results were even more gratifying than during the previous year, when control work was first started, and the almost total absence of mosquitoes during the season was proof to the efficacy of the methods used.

In connection with this work, the appreciation of the service is due both the Yosemite National Park Co. and the Curry Camping Co. for their extensive and valuable assistance. On account of extreme shortage of funds, it was impossible for the service to handle the situation without assistance, and both of these operators extended help both in the way of labor and oil for spraying. Without their help much of what was accomplished would have had to be left undone, and results would have been much less satisfactory.

CONTROL OF OTHER PESTS.

Mosquitoes and forest insects are not the only pests with which we have to contend, but ground squirrels, mice, and gophers ordinarily abound in great numbers and with most destructive results to gardens, lawns, and, in the case of mice, equipment.

During the late fall of 1919 a campaign covering the entire valley was begun against the ground squirrels by the use of poisoned barley. This was carefully placed in the entrances to their dens, but well under the surface of the ground to prevent it being picked up by birds or other harmless animals. Literally thousands of the animals were killed, with the result that during the past season the valley has been comparatively free from the pest.

Curiously enough it seems that the measures undertaken, only with the thought of eliminating the ground squirrel, had as an unexpected result a very marked reduction in the number of mice; and where there were formerly thousands of these destructive mammals, few are now to be found.

The elimination of the gopher, so destructive to lawns and gardens, however, presents a more difficult problem, and a way has not yet been found where they can be eliminated in such numbers and so readily as were the ground squirrels and mice. Several means have been tried, such as regular gopher traps, poisoned raisins, and gas bombs, the latter manufactured commercially for this purpose. Of the three methods used, the latter has been the most effective; and while complete control of the situation has not yet been achieved, it has been possible at least to more than keep ahead of the normal increase through propagation.

TIMBER OPERATIONS.

With view to further preserving the scenic beauty of the Wawona Road, another exchange is being negotiated by which an extensive timbered area in the Grouse Creek watershed and a portion of the company's timber holdings in the lower Indian Creek Valley will come into Government ownership, in return for which Government-owned timber of equal value in less valuable park areas in the western part of the reservation will be relinquished to the company. This is in line with the park policy of preserving the timber in its natural state along its main traveled routes.

A similar exchange has been discussed with the White & Friant Co. with a view to preserving from cutting timber owned by them along the Big Oak Flat Road. Should these two exchanges be consummated, practically all private holdings will have been

eliminated along both the Big Oak Flat and Wawona Roads and the natural timber screen along them preserved for all time. It is to be hoped that legislation may soon be enacted by which the Forest Service may negotiate similar exchanges outside of the park so that the approach roads to the park may be similarly protected. This applies particularly to the Big Oak Flat Road and Tioga Road approaches on the west side of the park and the road connecting the Tioga Road with Mather station, the Hetch Hetchy entrance, which pass through the most beautiful sugar and yellow pine forests now held in private ownership, and slated for destruction in the near future unless some such measures are taken for their preservation. It would be a pity and a shame to allow the condition now existing along the road leading to the Mariposa Grove of Big Trees from Wawona to be here duplicated.

The city and county of San Francisco, in connection with their Hetch Hetchy water supply and power project, operated a sawmill on their Hog Ranch property located in section 2, township 1 south, range 19 east, Mount Diablo meridian. They started moving this mill on about July 1, 1919, from the former location in the southwest quarter of the northwest quarter, section 32, township 1 north, range 20 east, Mount Diablo meridian, to its present location in the southeast quarter of the southwest quarter, section 2, township 1 south, range 19 east, Mount Diablo meridian. The first logs were cut at the new location on October 19, 1919. During the year they employed an average of 35 men in this operation. They closed the sawmill for the winter on January 23, 1920, and reopened it on May 17, 1920. During the period the mill was closed they operated their planing mill and made the necessary repairs to sawmill and logging equipment preparatory to the 1920 season.

During the year they sawed 1,662,117 feet board measure of lumber. They cut over 51 acres of land located in southeast quarter and southwest quarter of section 2, township 1 south, range 19 east, Mount Diablo meridian. The slashings, debris, etc., resulting from the cutting of timber on lands adjacent to and in view from the Hog Ranch Road have been cleaned up and burned. The former mill site at Canyon Ranch, located on the Hetch Hetchy Railroad, has not been cleaned up as yet, and this condition makes an unsightly appearance in this area which should be attended to at once.

In the development work of the Hetch Hetchy water supply and power project, the city during the months of July and August, 1919, employed an average of 75 men at their Hetch Hetchy camp. On September 1, 1919, the Utah Construction Co., under contract to build the main Hetch Hetchy dam, took over the city's Hetch Hetchy camps. During the balance of the fiscal year the city employed an average of seven men at this camp in general office work, surveying, and superintendence.

During the year the city completed the construction of their Early intake to Hetch Hetchy camp power line and are furnishing this camp electric power for domestic and power purposes.

The city employed an average of about 15 men at their Lake Eleanor camp from July 1, 1919, to February 20, 1920, in the work of clearing the Lake Eleanor reservoir site. About 95 acres of this area has been cleared. During the balance of the year, two men were employed at this camp as watchmen. During April, May, and June, 1920, they employed an average of about nine men in work of repairing the Hetch Hetchy to Lake Eleanor auto road, which has been completed.

The Utah Construction Co., starting on September 1, employed an average of about 185 men during the balance of the fiscal year at their Hetch Hetchy camps Nos. 1 and 2.

During this period they completed the construction of their camp No. 2 on the floor of the Hetch Hetchy Valley and also a number of dwelling houses, a general store building, and a schoolhouse at their dam site camp No. 1. They also completed the construction of a backwater dam below the main dam, a diversion dam, the lengthening of the diversion tunnel, a railway connecting the Hetch Hetchy Valley, a cableway across the Tuolumne River, and the widening of the loop line at the end of the Hetch Hetchy Railroad.

Other work in progress at the close of the year consisted of the construction of a narrow-gauge railroad up the floor of the Hetch Hetchy Valley, to be used in transporting rock, etc., for the concrete in the construction of the main Hetch Hetchy dam. The work on this railroad was about 95 per cent complete; the excavation for the main dam above the 3,500-foot contour was about 80 per cent complete, and the construction of a rock-crushing plant had been started, the foundation of which had been completed on June 30, 1920.

The Yosemite Lumber Co., operating in townships 3 and 4 south, ranges 20 and 21 east, Mount Diablo meridian, employed an average of about 214 men during their logging season. They closed down their operations at camp No. 9 for the season of 1919 on December 6, 1919, and started their 1920 season with two camps; No. 2 in the northwest quarter of the northwest quarter of section 27, township 3 south, range 20 east, and No. 9 in the south half of the southeast quarter of section 9, township 4 south, range 21 east, on March 15, 1920. They operated 11 donkey engines hauling to 6 landings and 8 Shay locomotives to move their log cars.

During the year ending June 30, 1920, they cut and shipped to their mill 26,928,498 feet board measure of logs on 6,280 cars, an average of 4,288 feet board measure per car. In this operation they cut over about 737 acres of land, of which 598 acres are within the boundaries of the Yosemite National Park and located in sections 3, 4, 9, 10, 15, and 16, township 4 south, range 21 east, Mount Diablo meridian, and 138 acres within the boundaries of the Sierra National Forest, and located in sections 21, 27, and 28, township 3 south, range 20 east, Mount Diablo meridian.

FISH AND GAME.

In contrast with last year, when, as a result of the operation on an experimental hatchery by the State in Yosemite Valley, more than 400,000 trout fry were planted, less than 200,000 were furnished this year. These were received from the State fish and game commission in August in a shipment to El Portal consisting of 16 cans of rainbow, 24 cans of eastern brook, 24 cans of Loch Leven, and 24 cans of German brown trout. Thirty-five cans of eastern brook and German brown were distributed along the Merced River between El Portal and Happy Isles, 1 can of eastern brook in Tamarack Creek on the Big Oak Flat Road, 24 cans of eastern brook and Loch Leven in Tenaya Lake on the Tioga Road, 2 cans of rainbow in Cathedral Creek on the Tioga Road, 6 cans of

rainbow and Loch Leven in the Tuolumne River at Tuolumne Meadows, 4 cans of rainbow and Loch Leven in Dog Lake, 10 cans of rainbow and Loch Leven in Return Creek in Virginia Canyon, and 2 cans of Loch Leven in the upper of the three McCabe Lakes.

This plant represents new stocking in Virginia Canyon and McCabe Lakes only, other waters stocked having been stocked also in previous years.

While the rather intensive stocking of park streams that has been carried on during the past five or six years has borne excellent results in all waters stocked, the most gratifying result has been that achieved in Tenaya Lake. Here for several years, in spite of repeated planting, for some reason, generally attributed to the existence in the lake of innumerable suckers which it is claimed not only eat the young fry but also the spawn of those escaping the earlier attacks, trout could not be established. During the past four years, however, some 400,000 or 500,000 fry have been here planted, and a sufficient number seem to have survived to insure their complete establishment and control of the lake, and this year, for the first time, successful trout catches have been reported. This beautiful body of water has lost much of its attraction to the tourist in the past on account of the absence of fish; but now established as a fishing lake, should, and undoubtedly will, receive the appreciation it merits.

There is nothing of special interest to report on game and bird life in the park. Deer, bear, and birds abound in the usual numbers throughout the park, each in its natural habitat, with indications of a probable decrease in the numbers of their natural enemies, particularly in the case of coyotes and mountain lions, of which fewer than usual have been reported.

STATE ABANDONS FISH HATCHERY.

During the summer of 1917 application was made by the California State Fish and Game Commission to build, maintain, and operate a fish hatchery in Yosemite Valley. As there was some question at the time as to how such a privilege might be handled in event of cession of exclusive jurisdiction to the Federal Government, which was in contemplation, the application was denied and negotiations were entered into with the Federal Bureau of Fisheries with view to having that bureau install a federally controlled and operated hatchery. During the following winter, however, the State fish and game commission renewed their application to the department, this time by representatives in person, and after a further study of the legal phases of the proposition, an agreement was executed leasing to the State for a period of 20 years a site near Happy Isles containing approximately 3 acres.

Among other things, this agreement provided that a building should be erected at the expense of the State of a design appropriate to the surroundings and acceptable to the department, but that, in case for any reason the Federal Government should at any time see fit to take it over, the State would be reimbursed in the amount of its original cost less reasonable amount for depreciation. The interests of the State were thus fully protected, and the added fact that water was to be furnished free from the park mains, and distribution of fry was to be made by the park force without cost to the State, together with the opportunity offered to show the people of California, as well as many thousands from other parts of the country, something of the work the commission is doing, made this to all appearances an attractive development for the State.

On account of war conditions it was impossible to erect the building during 1918, but early in 1919 timber for the frame work of the building was gotten out, and in the spring a temporary hatchery was installed on the site of the proposed permanent building, some 400,000 eggs were placed in the troughs, and apparently actual construction of the permanent building was awaiting only results of the experiments being carried on in the temporary hatchery.

As a matter of fact, the experimental hatch was beyond anticipation, the water and other conditions proving particularly adaptable to fish propagation, and after the entire hatch had been distributed the last obstacle to final construction of the permanent hatchery in accordance with the State's contract seemed to have been removed. After all this it was with considerable surprise and regret that in late October, without notice or advice, the temporary plant was suddenly dismantled and removed without explanation or reason.

Since that time no step has been taken by the State toward carrying out its contract nor has the contract been abrogated. In the meantime the park is without a much-needed hatchery from which to stock its lakes and streams sufficiently well to even approximately meet the demands of its thousands of visitors and is yet wholly dependent upon the relatively small supply of fry that the State fish and game commission can afford to furnish from its other hatcheries in the State.

It is to be hoped that this very unsatisfactory situation can be straightened out at an early date and that the State will take steps to carry out the terms of the agreement entered into in good faith between the fish and game commission and the department. Both the State and the park are suffering by the continued delay.

INFORMATION BUREAU.

After five seasons of operation the information bureau has become an indispensable unit of park operation and one the importance of which to the public can not be estimated. Here more than 25,000 campers were registered and assigned to camps during the season, road and trail information was given out, and thousands of questions answered with regard to all facilities offered in the park. It has served in one way or another fully 90 per cent of the total number of visitors, as sooner or later practically everyone makes application there for authentic information.

In connection with this bureau a branch office of the California State Automobile Association was operated, in charge of an exceptionally competent representative of the association. Here general road information is given out and all road maps issued by the association furnished upon inquiry without charge, whether to members of the association or not. The closest cooperation has been received from the California State Automobile Association, and it is a pleasure to state that their representation here is a most valuable adjunct to our park information bureau.

FREE NATURE GUIDE SERVICE INAUGURATED.¹

In addition to the purely recreational advantages the park offers, it also affords exceptional opportunities for the study of geology and natural history, and there is, and has been, a very notable demand on the part of park visitors to gain information in this field. Unusual interest is displayed by visitors in efforts to ascertain the cause of the sheer walls of the valley, why the smoothly polished granite domes so characteristic of the region exist, and the names and characteristics of the flowers and trees, and the names and habits of the park mammals and birds.

It seemed, in order to meet this demand and at the same time be able to give out not only interesting information but authentic, that there should be some one on the ground versed in the geology and natural history of the region to disseminate it. Accordingly, in cooperation with the California State Fish and Game Commission, the park service inaugurated the nature guide service. This service was directed by Dr. H. C. Bryant, of the University of California, who conducted the work for a period of three months, from June to August, inclusive. Dr. Bryant was assisted during the height of the season, from June 15 to July 15, by Dr. Loye Holmes Miller, of the southern branch of the University of California.

This service was established during the past season as an experiment. The very marked enthusiasm and appreciation with which the experiment has been received has been certainly sufficient not only to justify, but to demand, its continuation as a free public service as much as the free camping grounds and other conveniences and facilities furnished by the Government for the benefit of park visitors.

The deeper interest in the flora and fauna of the park as one of the results of the inauguration of the nature guide service makes more than ever necessary that a park museum be established. Heretofore this has been impossible on any scale because of lack of space. With the completion of the new rangers' and officers' club, however, the buildings now occupied for that purpose will be vacated and, although not particularly well suited, can be utilized for museum purposes, at least until such time as more suitable space is available. Specimens of birds, animals, flowers, plants, trees, geologic formations, Indian baskets, etc., of the park will be the principal exhibits, but it is also intended to have exhibits of other national parks. Quite extensive collections have already been made, and another year should see a very representative collection on exhibit.

IMPROVED POST-OFFICE FACILITIES.

Congestion, and generally inadequate service, together with a woeful lack of facilities, has made the post-office situation in Yosemite a feature calling forth the severest public criticism. As a result of negotiation with the Post Office Department, in connection with which the postal conditions were subjected to a thorough inspection by post-office officials, the third-class offices in Yosemite village and at Camp Curry were discontinued on May 1, and a second-class office established in the village, with branch offices at Camp Curry and Yosemite Lodge. Additional space was provided, avoiding the congestion of former years, and a competent and at the same time larger force of clerks, adequate to expeditiously handle the mail, was installed. The improvement has been notable and complaints have practically ceased.

In addition to the improvement of post-office facilities, the Post Office Department also took over the operation of the star route between El Portal and Yosemite. Four Government owned and operated three-quarter-ton Commerce trucks and two 4-ton Moreland heavy-duty trucks have been furnished for the route, which has been in operation since June 10.

Here also a marked improvement in service has been effected, the arrival and departure of mails moving on clockwork schedule.

There yet remains to extend the service to include rural delivery to the public camps. This feature will undoubtedly soon come, but there yet remains much to be done in the way of preparation before its successful operation can be assured.

AEROPLANE ACTIVITIES.

During the past winter considerable interest was shown by various commercial aeroplane concerns in the possible establishment of passenger aeroplane service both into and within the park, and a number of applications were received for permission to inaugurate such a service.

Although some four or five successful landings had been made in the valley during the previous summer, air and emergency landing conditions had not received sufficient study to warrant recognition of such a service. Accordingly no serious consideration was given to the granting of a concession nor, on the other hand, was any action taken to prevent use of the field by individual pilots on their own responsibility. In fact such use of the field was encouraged, as only in this way can the feasibility of aeroplane service in the park be determined. At a small expense, carried largely by the Yosemite National Park Co., the field was improved and well marked to the end that landings attempted at the proper time of the day could be made with the usual safety experienced on any landing field.

In all, about a dozen landings were made without mishap, in some cases the planes carrying from one to two people in addition to the pilot. In spite of warnings against the practice, however, stunt flying was indulged in over the valley by most of the pilots, which led to the issuance and distribution to the various aviation firms throughout the State of regulations prohibiting this practice, and including nonrecognition of passenger carrying for pay, and general instructions regarding the use of the field, as follows:

"1. *Carrying of passengers.*—No air passenger-carrying service into or within the park is authorized. Ships carrying passengers who are paying either directly or indirectly for transportation thus afforded shall not be permitted the use of the field except in case of forced landings due to operating trouble.

¹ The report of the Nature Guide Service will be found on pp. 253-257.

"2. *Landings.*—Landings may be made at any time, but pilots should bear in mind that the best times to land are before 10 o'clock a. m. and after 5 o'clock p. m. During these periods the air is calm and of uniform density. Between 10 a. m. and 5 p. m., on the other hand, a treacherous wind blows from the west, creating cross currents and causing 'pockety' conditions. These winds occur daily and during the same hours, and during this period of the day flying between the precipitous walls of the valley is exceedingly inadvisable, if not actually dangerous.

"3. *Take-offs.*—As field conditions do not permit taking-off against the wind, ships shall not be permitted to take-off between the hours of 10 a. m. and 5 p. m., but only before and after these hours while calm prevails.

"4. *Stunt Flying.*—'Stunt' flying, either with or without passengers, shall not be permitted under any condition.

"5. *Violations.*—Pilots violating any of the above regulations shall forfeit their right to the use of the present field, or of any other landing place that might later be provided within the park, for such period as the superintendent may decide, or may be subjected to penalties as provided in the general regulations governing the park.

"6. The Government assumes no responsibility whatsoever for accidents or damages resulting from the operation of aeroplanes flying within the park."

While we were given to understand in each case where passengers had been brought in that fare was not being received, I am inclined to think this was not the case, as immediately these regulations were distributed aeroplane travel ceased and no more landings have been made.

There seems to be no doubt that aeroplane service to and within the park will be a practical proposition in the near future, but it certainly would not be wise to inaugurate such a service until more pioneering work has been done than has so far been accomplished. There is no doubt of the comparative safety of operation within the valley and of safe landing and take-off conditions at certain hours of the day, but until a study is made of the possible emergency landing fields, of which there are many that could be developed by utilization of the numerous mountain meadows within the park, and until they have been properly marked and mapped, the service would not be justified in assuming the responsibility of granting permission for the inauguration of regular air passenger service.

TRAVEL.

While travel to the park this year has been heavier than ever before, and a substantial gain was recorded over last year's record-breaking season, the final count did not reach the mark that the early season rush led us to anticipate. Early in April, before any of the mountain roads were passable, travel by rail was far in excess of anything ever before recorded for that month, and immediately the Wawona Road was opened, on the 23d of the month, motor travel began to increase the number of visitors. During the month of May motor travel showed an increase of more than 50 per cent over May of the previous year, and travel by other means nearly 30 per cent, or an increase in total travel of 41 per cent. The total increase for June was less than 10 per cent, while July showed a slight decrease over July of last year. August and September each showed a slight increase over that recorded for the same months last year.

The failure of travel to maintain the early season pace can be attributed to a combination of reasons and conditions. Early in June began a very marked shortage of gasoline, which continued throughout the season. At first it seemed to be ignored so far as possible, and those planning a trip to the park seemed to manage somehow to secure sufficient to make the trip, and park travel did not seem to be affected by the condition until well into July, when it had a very marked effect. Again by the middle of June all possible space had been reserved, including even camping equipment, and it was necessary to warn the public against coming into the park unless they had confirmed reservations or brought their own camping equipment. This, of course, prevented hundreds, if not thousands, from coming and diverted them elsewhere for their vacation, and it soon developed that it was easier to get this information before the public than it was to correct the impression after the congestion was relieved, and undoubtedly large numbers who would have come to the park later did not do so because the idea still prevailed in the public mind that accommodations were at a premium. And last, but by no means least, late season travel was greatly affected by road conditions. Unable to do more than to just put the roads in passable condition at the time of opening, without being able to follow with maintenance work, as is usually done, by the end of June all roads, including those on the valley floor, had reached an unusually bad state of repair. By July, when funds for the work of repair were available, it was next to impossible to secure labor, in spite of which, however, the mountain roads were brought to at least as good as their usual state at that time of the year, which, on account of the soil condition so late in the dry season, is always far from good.

Rain in the latter part of the season, which brought light snow for a few days in the high country, put the roads in better shape than at any time during the season. But, as is usually the case, the first fall rain led to a diminution of travel rather than an increase, as should be expected.

It is a singular thing how motorists fear the mountains in the autumn and thereby deprive themselves of the enjoyment of the most delightful season of the year in the park. September and October are by far the most attractive months of the year, but it seems impossible to impress this idea upon the public, who for some reason seem imbued with the idea that after August the valley and surrounding country are covered with snow and entirely inaccessible, instead of invigorating, delightful, and most beautiful in their multicolored autumn garb.

The total number of people entering the park during the year ended September 30 was 68,908. The following tables give an analysis of this total:

Automobiles and motor cycles.

Entrance.	Road.	Number of automobiles.	Number of people.	Number of motor cycles.	Number of people.
<i>Season 1919.</i>					
Alder Creek.....	Wawona.....	6,545	23,471	93	137
Crane Flat.....	Big Oak Flat.....	1,291	4,832	18	31
Merced Grove.....	Coulterville.....	86	296		
Aspen Valley.....	Tioga.....	265	890	2	4
Tioga Pass.....	do.....	1,690	5,648	3	5
Yosemite.....	Various.....	161	502	5	11
Returns through Aspen Valley from Crane Flat.....		796	2,767		
Returns through Crane Flat from Aspen Valley.....		1,275	4,494		
Total.....		12,109	42,900	121	188
<i>Season 1920.</i>					
Alder Creek.....	Wawona.....	7,651	26,941	95	130
Crane Flat.....	Big Oak Flat.....	2,020	6,978	29	44
Merced Grove.....	Coulterville.....	73	235	2	2
Aspen Valley.....	Tioga.....	405	1,271	3	4
Tioga Pass.....	do.....	1,416	4,500	3	4
Yosemite.....	Various.....	145	480	1	2
Returns through Aspen Valley from Crane Flat.....		710	2,391		
Returns through Crane Flat from Aspen Valley.....		998	3,278		
Total.....		13,418	46,074	133	186

Other means of transportation.

	1919	1920
Travel by auto stages other than via El Portal Road.....	3,237	3,525
Travel via Yosemite Valley Railroad and El Portal Road.....	11,043	18,111
Travel by wagon, horseback, and on foot.....	994	1,010
Total travel other than by private cars and motor cycles.....	15,274	22,646

Summary.

	1919	1920
Travel by—		
Private automobiles.....	42,900	46,074
Motor cycles.....	188	186
Auto stages other than El Portal.....	3,237	3,525
Wagons, foot, horse, etc.....	994	1,010
Yosemite Valley Railroad.....	11,043	18,111
Total.....	58,362	68,906

FRANCHISES AND PERMITS.

The following franchises and permits were in effect and operative during the season of 1920:

Name.	For what granted.	Expiration.	Annual rent.
E. N. Baxter.....	Sale of curios, photos, etc.....	Dec. 31, 1920	\$75
Mrs. John Degnan.....	Delicatessen store.....	do.....	1 250
H. C. Best.....	Studios, photos, etc.....	do.....	1 250
A. C. Pillsbury.....	do.....	do.....	1 250
J. T. Boyesen.....	do.....	do.....	1 250
D. J. Foley.....	do.....	do.....	1 250
Dr. F. L. Stein.....	Hospital.....	Aug. 15, 1923	2 200
Yosemite Stage & Turnpike Co.....	Automobile stage line.....	Dec. 31, 1931	100
Trustees of Yosemite school district.....	Lease of site for schoolhouse.....	Dec. 31, 1936	None.
Curry Camping Co.....	Public camp.....	Dec. 31, 1939	22½%
Yosemite National Park Co.....	Hotels, chalets, inns, camps, transportation service, store, and dairy.	Dec. 31, 1938	(*)

¹ Permit fee fixed at 4 per cent of gross revenue; \$250 minimum.

² Permit fee fixed at 4 per cent of gross revenues; \$200 minimum.

³ 22½ per cent of operating profits after deduction of 6 per cent on physical investment.

Lease, special-use, and water-power permits under act of Feb. 7, 1905, segregating lands from Yosemite National Park and placing same in Sierra and Stanislaus National Forests.

Period.	Name and privilege granted.	Compensation exacted.
Indeterminate period.	Yosemite Valley R. R. Co. Lease dated Sept. 5, 1905, grants to company right to construct and operate electric railway along Merced River to park boundary. Rate may be readjusted and fixed by President of United States after expiration of first 3 years under lease.	¹ \$1,000
Do.....	Yosemite Valley R. R. Co. Special-use permit issued by Forest Service, approved Feb. 7, 1908, by S. J. Flintham, acting forest supervisor, authorizes construction of diverting dam, pipeline, and water tank for conveying water from a spring and storing in tank for use in operating company's electric road. All timber cut to be paid for under timber settlement regulations of Forest Service.	.....
Do.....	Yosemite Lumber Co. Special-use permit, approved by district forester, Forest Service, June 27, 1911, for right to construct logging railroad and inclined tramway in Sierra National Forest, for removal of timber adjacent to company's road. All timber used to be paid for at rate to be fixed by forest supervisor, Sierra National Forest, which shall correspond with prevailing stumpage rates charged on said national forest when timber is cut. Stipulations signed by company June 20, 1911, and approved June 27, 1911, by District Forester F. E. Olmstead, accompanying the permit, require annual payment (outside of charge for live and dead timber, standing and down, cut, damaged, killed, or destroyed along right of way, title to which at time of cutting is in United States) of \$1,200 on demand therefor being made by the Secretary of the Interior.	¹ \$1,200
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), authorizes construction and operation of telephone line along inclined tramway and logging railroad in Sierra National Forest.	(*)
Do.....	Yosemite Lumber Co. Special-use permit, approved Nov. 22, 1911, by E. G. Dudley, acting forest supervisor, Sierra National Forest (Forest Service), covers right of way for and authorizes construction and operation of pipe line about one-half mile long from spring on lands segregated from park (in Sierra National Forest) for purpose of piping water from company's inclined tramway and logging railroad to supply boilers of steam hoisting plant, etc.	¹ 10
50 years ⁴	Merced River Electric Co. (project "A"), final water-power permit granted by Agriculture Department (Forest Service), Apr. 11, 1911, running for 50 years, unless sooner revoked by that department, for right of way for diverting dam and power conduit in Stanislaus National Forest. Annual charge over lands segregated from park based on 1,460 horsepower, at 10 cents per horsepower for first year, with increase of 10 cents per horsepower each succeeding year until maximum charge of \$1 per horsepower is reached, annual charge thereafter being at latter rate. Stipulations signed by officers of company Mar. 21, 1911 (and accompanying above permit), provided that payment upon above basis should be made annually in advance from Jan. 1, 1912, permit, however, being approved Apr. 11, 1911, and first payment, \$146, being made June 7, 1911; this payment was applied on 1911 calendar year. Amount due for fourth year, 1914, 1,460 horsepower, at 40 cents; horsepower capacity subject to readjustment after expiration tenth year.	384

¹ Per annum, on demand of Secretary of Interior.

² Value of all timber cut and paid for on right of way (payment of \$406.56 made May 3, 1912, and \$334.56 made Oct. 3, 1912), \$741.12.

³ Per annum, in advance.

⁴ Unless sooner revoked by the Department of Agriculture.

EXCERPT FROM ACT OF CONGRESS APPROVED DECEMBER 19, 1913, GRANTING TO THE CITY AND COUNTY OF SAN FRANCISCO CERTAIN RIGHTS OF WAY IN, OVER, AND THROUGH CERTAIN PUBLIC LANDS IN THE YOSEMITE NATIONAL PARK AND STANISLAUS NATIONAL FOREST ADJACENT THERE TO.

Section 7 of the above act provides that for and in consideration of the grant by the United States as provided for in this act, the said grantee shall assign free of cost to the United States all roads and trails built under the provisions hereof; and further, after the expiration of 5 years from the passage of this act the grantee shall pay to the United States the sum of \$15,000 annually for a period of 10 years, beginning with the expiration of the 5-year period before mentioned and for the next 10 years following \$20,000 annually, and for the remainder of the term of the grant shall, unless in the discretion of Congress the annual charge shall be increased or diminished, pay the sum of \$30,000 annually, said sums to be paid on the 1st day of July of each year. Until otherwise provided by Congress, said sums shall be kept in a separate fund by the United States, to be applied to the building and maintenance of roads and trails and other improvements in Yosemite National Park and other national parks in the State of California. The Secretary of the Interior shall designate the uses to be made of sums paid under the provisions of this section under the conditions specified herein.

Section 4 of the act provides that no timber shall be taken, cut, or destroyed within Yosemite Park or Stanislaus Forest except as such may be actually necessary to construct, repair, and operate its reservoirs, dams, power plants, water-power and electric works, and other structures mentioned in the act, but that no timber shall be cut or removed from lands outside of the right of way until designated by Secretary of Interior or Secretary of Agriculture, and the grantee shall pay the full value of all timber and wood cut, injured, or destroyed on or adjacent to any of the rights of way and lands, as required by either of said officers: *Provided*, That no timber shall be cut by the grantee in Yosemite Park except from land to be submerged or which constitutes an actual obstruction to the right or rights of way or to any road or trail provided for in the act.

YOSEMITE HIGHWAY CERTIFICATE PLAN FAILS.

The plan conceived nearly two years ago and put into effect in the spring of 1919 of raising \$1,000,000 by means of the sale of \$5 certificates exchangeable for season automobile permits to the park to aid in the construction and paving of the unfinished portion of the highway from Merced to El Portal to connect with the recently rebuilt highway from the latter place to Yosemite failed to meet with the response that was originally anticipated, with the result that after selling approximately \$100,000 worth of certificates the project has had to be for the time abandoned.

Failure was due principally, I think, to lack of the proper organization to effectively carry out the plan, but the fact that the drive followed so closely the many war-service drives and requests for voluntary contributions for charitable organizations was a very important contributing factor.

The money actually collected in the campaign has been deposited in trust to be expended by the California State Highway Commission for paying a portion of the road when the grading shall have been completed.

The plan has, however, not been permanently abandoned, but will be taken up again at some later date, at which time it is yet believed the total amount sought can be secured.

An all-year paved road into Yosemite would be a valuable asset to the State as well as to the park, and I do not believe the opportunity offered will be ignored by the motorists of the State when the campaign is again undertaken with a more complete organization.

PATENTED LANDS.

No transfer of patented land to Government ownership has been effected during the year, although, as mentioned elsewhere in this report, a possible exchange has been discussed with the White & Friant Co., which if consummated would eliminate some 1,680 acres of the remaining 10,000 acres of privately owned lands in the park.

CHANGE OF PARK BOUNDARY DESIRABLE.

In my last report I took occasion to mention the desirability of eliminating from the park some 30,000 acres of land now included in the western part of the park, and extending the eastern boundary to include an equal area on the east slope of the Sierras, including the Devils Post Pile, Thousand Island Lake, and Rush Creek country.

The area it is proposed to eliminate from the park has little to commend it as a park region and contains about 70 per cent of all of the remaining privately owned lands in the park, much of which is scheduled for lumber operations within the near future. The area suggested as an addition, on the other hand, is of exceptionally scenic character, wholly suitable for development for park purposes, and contains little or nothing of value commercially.

It is again urgently recommended that steps be taken to secure legislation effecting the change.

LE CONTE MEMORIAL LECTURES.¹

The Le Conte memorial lectures, inaugurated last year by the University of California through its university extension division, were continued, receiving fully as much or more approbation by the public as was the case last year.

The illustrated lectures by Dr. Grinnell and Dr. Clinton Hart Merriam were given in the Government pavilion in Yosemite village, while the others were given in the outdoor auditorium, erected by the service in cooperation with the Sierra Club, near the Le Conte Memorial Lodge.

¹ The 1920 program of lectures is given on p. 52.

CONTRIBUTIONS.

While on a trip to the park during the month of December with a party of prominent San Francisco business men, Director Mather, of the service, announced a gift to the Yosemite rangers of a \$26,000 clubhouse. Preparation of plans was immediately begun by Mr. Charles Sumner, architect, of San Francisco, and the building was completed in September, on the 25th of which month dedication ceremonies were held, attended by some 25 prominent park enthusiasts.

At the time Mr. Mather announced his gift, other members of the party subscribed \$2,000 for the furnishing of the building, all of which was in place at the time of the dedication.

The building is a most attractive one, of Swiss style of architecture, provides complete living and mess quarters, and will serve as a standard type for future buildings.

Better than this, however, from a practical standpoint, it fills a long-needed want. Among its employees the park has a number of single men who, because of failure on the part of the Government to provide quarters, have been long hard put to obtain suitable sleeping and eating accommodations. Two years ago the old Jorgenson studio buildings, vacated by the artist Mr. Chris Jorgensen, were made over into temporary quarters and mess room, and although wholly unsuited for the purpose, have been made to serve pending the availability of something better. It is unnecessary to mention the enthusiasm with which this wonderful gift was received by the men, and I am sure their appreciation will not be short lived.

The advisability of introducing the California Valley elk into the valley has long been considered. While these animals were never native to the valley, they were native to the country immediately below, and it was believed that their introduction here would afford a very decided added attraction to the wild life of the park.

Through the efforts of Mr. Hall McAllister, of San Francisco, the interest of the California Academy of Sciences was aroused, with the result that a fund was created for the securing of 10 or 12 of the animals, their transportation to the park, and the building of a corral to inclose them. At this writing the corral has been completed and the herd is expected to arrive shortly.

While it will be necessary to keep the animals under fence until they have been acclimated to their new surroundings, it is intended eventually to give the herd its freedom in the belief that it will confine itself to the valley.

There has long been a need for an outdoor auditorium where lectures might be held. This was particularly so in connection with the Le Conte memorial lectures, some of which at least it was desired to hold at or near the Le Conte Memorial Lodge. Temporary seating of the audience in front of the lodge had not been satisfactory the year before because of the unevenness of the ground. So with the cooperation of the Sierra Club a very satisfactory outdoor auditorium with log seats and canvas back and a rustic speaker's platform was erected at a very small cost. While not in the least elaborate, it is at least attractive and at the same time serves the purpose for which intended.

LABOR CONDITIONS.

Never have labor conditions in the park been so unsatisfactory as during the past season. Not only has it been impossible to secure anything like the quantity needed, but the very noticeable indifference to results on the part of a large percentage of that secured has decreased the efficiency of our crews at least one-half. This lack of efficiency, together with the very appreciable increase in wages it has been necessary to pay, has made it impossible to secure anything like normal results.

DISPOSITION OF REVENUES.

The net total of revenues collected in the park during the fiscal year ending June 30, 1920, amounted to over \$93,000, of which approximately \$55,000 was received from the sale of automobile permits. These funds are covered into the miscellaneous receipts of the Treasury, where they are no longer available for allotment for park purposes, leaving the park, therefore, entirely dependent upon congressional appropriations, which are usable only within the fiscal year for which appropriated. With the fiscal year ending as it does on the last day of June, considerable hardship is worked upon all field services of the Government, as shortage of funds near the end of the year almost invariably necessitates curtailment of expenditures and with it a disruption of organization at a time when every advantage should be taken of the midsummer working conditions. Peculiar conditions here make this particularly felt in Yosemite.

Men are generally plentiful in the spring and, in connection with the opening of the roads and other preparations for the opening of the heavy travel season, by the middle of May a good working organization is on the job. Invariably, however, by mid-June it becomes necessary to curtail expenses and cut down the working force. The men let out seek employment elsewhere, generally in the harvests in the lower country, and at the same time draw others with them, with the result that when July 1 comes along and new funds are available, it is impossible to reorganize for anything like immediate work. In fact, reorganization is delayed until September when the harvests are over and labor is available. In the meantime from two to two and a half months, or 50 per cent of the working season for that year, have been lost.

Were the revenues collected in the park deposited in a special fund of the Treasury for reallocation for park purposes, as was the case prior to July 1, 1918, it would be possible to retain in reserve a sufficient amount to provide for this contingency, and we would be enabled to hold together throughout the season the working organization recruited in the spring when labor is plentiful.

Aside from this argument, it seems only logical that the revenues collected in a park should be available for use for betterment of the park in which collected. Were this the case there would be an incentive to increase the revenues, and many a dollar in revenue could be collected, representing a substantial profit, that is not collected now because its earning means the expenditure of something from our working funds, thereby decreasing the amount available for operation.

Further, there is the public viewpoint to be considered, particularly as it applies to the moneys collected from the sale of automobile permits. The motorist, when he

purchases a permit, naturally assumes the money he pays goes directly toward the maintenance and improvement of roads. On that basis there is little objection to the tax expressed, but when he ascertains that such is not the case, satisfactory explanation is not always easy.

IMPORTANT IMPROVEMENTS.

In spite of the material increase in costs of everything going into construction, and the very unsatisfactory labor conditions, since my last report a number of very important improvements have been completed in the park, both by the service and the park operators.

On the part of the Government, the most notable improvements effected were the practical completion of the grading of the El Portal-Yosemite Road; the completion of the New Stoneman Bridge, a reinforced concrete structure with a span of 80 feet and a 16-foot roadway, across the Merced River in front of Camp Curry; completion of a new road to Mirror Lake; completion of road and ranger stations at Inspiration Point, Alder Creek, and in the Mariposa Grove of Big Trees, and a complete topographic survey of the floor of the valley from Mirror Lake to the El Capitan Bridge on a scale of 400 feet to the inch, with a 2-foot contour interval. A mess house was also built for the feeding of the labor force.

The Yosemite National Park Co., in connection with its general development plan, erected a roomy and attractive garage for the conduct of their general garage business; erected at Yosemite Lodge 60 wooden cottages of from one to four rooms each, all equipped with electric heat and baths; installed permanent water and sewer systems at Glacier Point; built the Hetch Hetchy Lodge, consisting of kitchen and dining and two-room wooden cabins with baths.

Many other less important improvements of more or less temporary nature were also made by this company, such as the erection of a warehouse for use in conjunction with the general store operation, installation of baths and electrical heating and cooking equipment in the Sentinel Hotel, improvement and extension of the sewer system in Yosemite Lodge, extension of their general warehouse unit, etc.

The Curry Camping Co., at Camp Curry, in addition to improvement of their fire protection system, built a complete bath and toilet unit, a building for the housing of the branch post office, the transportation office, and the telegraph office, and a large, roomy building for storage of automobiles of guests of the camp.

RECOMMENDATIONS.

In order to meet adequately even the present demands, certain improvements on the part of the Government should be undertaken in the immediate future. Principal among these are the following, which are urgently recommended to be undertaken:

ADMINISTRATION BUILDING.

The need for a new building for carrying on the administrative work of the park and to supply adequate space for post-office and museum purposes was discussed at some length in my last report. The need for this improvement has not diminished, but rather is increasing each year as our activities extend with a corresponding increase in administrative work, and as the present building housing these activities becomes more and more dilapidated and the working conditions of our employees become unhealthful and disagreeable.

The park administrative force represents the Federal Government and is in constant touch with the public, to whom, in a sense, it is responsible for effective work. Pride in one's surroundings and working conditions is an important factor in efficient accomplishment, and it is very difficult for even the most cheerful to have that pride in work that goes with efficiency under present housing conditions of the force. Favorable action on the strength of this point alone, together with the air of dignity improved conditions would lend to the Government's representation on an operation as extensive and important as that presented in the administration of the Yosemite National Park, might well be given material weight in the consideration of a new administration building, even were there no question of inadequate space and insanitary conditions involved.

ROAD IMPROVEMENT.

As reviewed elsewhere in this report, the road situation presents probably the most serious problem in the park. Good roads is the essence of successful park development, the only item competing with it being that of adequate accommodations for the visitor after he has arrived.

The problem resolves itself into two phases: First, a plan for immediate improvement of existing conditions, with view to securing temporary relief from present impossible conditions until permanent improvement can be accomplished; and, second, a comprehensive plan for the permanent improvement of existing roads and the construction of certain other roads that are necessary to complete the road system that the park requires to satisfactorily handle its travel and relieve the rapidly increasing congestion in the valley. The first should be undertaken immediately, while the second should be considered as a 5-year program, to be continued from year to year along the lines of a definite plan until completed.

Immediately required improvements consist of:

1. Grading and graveling roads in the public camps, where now the most disagreeable conditions exist from impassable bog holes during the high-water period in the spring and early summer to unlimited dust and spring-breaking chuck holes during the dry period of midsummer and fall.

2. Extension of sprinkling system, both on the floor of valley and the El Portal Road, and the addition of sprinkling equipment, so that sufficient water may be got on the roads to eliminate the terrible dust nuisance for which Yosemite has become famous.

3. Appropriation of more funds specifically for road maintenance and repairs. This year's expenditures averaged approximately \$250 per mile, a wholly inadequate amount, as the condition of the roads during the season will testify. At least \$500 per mile should be allowed. Or, it might be worth considering that there be allowed for this

purpose at least the equivalent of the amount collected from the sale of automobile permits, and allow this to vary from year to year as travel varies.

4. Installation immediately of sprinkling systems on the Wawona, Glacier Point, Big Oak Flat, and Mariposa Grove Roads, where it is so apparent that with the present existing ordinary earth surface water is the only solution of keeping them even reasonably passable. These systems would be continued in use after the more permanent improvement of the roads, the character of which as proposed will be discussed later. These installations should be followed by similar installations along the Tioga Road.

The plan recommended for permanent road improvement involves paving of the roads on the floor of Yosemite Valley and the El Portal Road; the rebuilding of the existing mountain roads, modifying the grades; thoroughly draining the roadways, eliminating dangerous curves; and surfacing with gravel or crushed rock, as might be most convenient, thereby making the present crude imitations of automobile roads into good, safe country turnpikes; and the building of a 20-foot gravel-surfaced highway of easy grades from the valley to Tuolumne Meadows by way of Vernal and Nevada Falls. This latter proposed road has been the subject of much previous consideration, a survey having already been made last year, but with its terminus at Tenaya Lake rather than Tuolumne Meadows, as here suggested. I believe, however, the latter place would be the logical terminus of this road, being, as it is, the main point from which the bulk of back-country travel does and will continue to radiate. It will be doubly so with Tenaya Lake Lodge abandoned and moved to the Meadows, as will undoubtedly happen within another year.

Such a program it is estimated will involve the expenditure of about \$3,290,000, apportioned as follows:

Paving roads, floor of Yosemite Valley, 20 miles, at \$25,000 per mile-----	\$500,000
Paving El Portal Road, 8 miles, at \$25,000 per mile-----	200,000
Reconstruction Big Oak Flat Road, 14 miles, at \$10,000 per mile-----	140,000
Reconstruction Wawona Road, 20 miles, at \$10,000 per mile-----	200,000
Reconstruction Glacier Point Road, 14 miles, at \$10,000 per mile-----	140,000
Reconstruction roads in Mariposa Grove, 10 miles, at \$10,000 per mile-----	100,000
Reconstruction Tioga Road, 46 miles, at \$10,000 per mile-----	460,000
Installation sprinkling system and purchase equipment for same, Tioga Road-----	50,000
Construction of new road from Happy Isles to Tuolumne Meadows via Vernal and Nevada Falls-----	1,500,000
Total-----	3,290,000

It would take five years to economically carry on and complete such a program as outlined above, but at the end of that time Yosemite would have a road system such as its thousands of visitors are entitled to, and in which the park could take pride.

NEW BRIDGES NEEDED.

With the completion of the new Sentinel and Stoneman Bridges in 1918 and 1919, respectively, an excellent start has been made toward the securing of a system of permanent bridges on the roads on the floor of the valley. Not only have the old wooden and iron bridges been for years, for the most part, a source of continual expense for their maintenance and annual repairs, but a very serious risk to those using them.

Two of these prehistoric types still existing have reached a very marked state of decay and must be renewed in the very near future. The fact that they are standing and carrying the traffic they do is beyond comprehension and contrary to all laws of engineering. But they represent a real danger to traffic that should not be allowed to exist. I refer to Yosemite Creek and Happy Isle Bridges, for which plans have been prepared for a reinforced concrete structure at Happy Isles and a stone arch on the other site.

TRAIL SYSTEM.

While on the whole the park is well supplied with good trails, the Grand Canyon of the Tuolumne River, and much of that most scenic country to the north, remains practically inaccessible because of lack of trail connection with Yosemite Valley. There was started last year a trail from Hardon Lake into Pate Valley, in the Grand Canyon of the Tuolumne, but lack of funds as well as the existence of unsatisfactory labor conditions made its completion impossible. The trail when completed was to have formed a part of system proposed for the opening up of the Tuolumne Canyon and the country immediately to the north which is to consist, in addition to the above, of a trail from the Waterwheel Falls to Pate Valley and another from the latter point up Plute Creek to connect with the present existing Pleasant Valley Trail.

It is very desirable that this system be completed, as without doubt its completion would mean the popularizing of the Tuolumne Canyon country and also the whole northern part of the park, which contains some of the most magnificent mountain scenery in the entire Sierras, and where all streams and lakes abound in fish who are little aware that such things as fishermen exist.

WATER SUPPLY.

Extension of camp and hotel facilities, especially the increased number of baths and flush toilets, increased uses of water in the public camps, due to the greater number of campers, and the many other additional demands for water that naturally accompany resort development have placed the service in the embarrassing position of being entirely unable to give continuous supply to certain units not only of the park operators, but also of the park administration.

This can only be remedied by the development of a new supply at a higher elevation above the points of distribution than is either the present river or spring supply, and by increasing the capacity of the distributing system. The development of the new supply is being considered in connection with the installation of the new sewer system by utilizing the flow of Illilouette Creek above the present river intake, but there will still remain to be installed a distributing system supplementing the existing one.

FREE PUBLIC CAMPS.

During the past five years little has been done to improve camping facilities in the free public camping grounds, although since that time their use has been increased from about 5,000 campers to 25,000 in 1920, with an average population of more than 2,000 for a period of two months, and a maximum of nearly 3,000 in the early days of July.

In addition to road improvements heretofore mentioned, additional water supply should be afforded, fireplaces constructed, and a lighting system installed.

In connection with this improvement, and in addition to them, camping places should be installed along the park roads outside of the floor of the valley. Along all of the roads are well-defined natural camping sites where hundreds of campers pitch their tents annually. No sanitary conveniences are afforded, with the result that before the season is far along very unsatisfactory conditions prevail.

Not only should such facilities be provided in the interests of sanitation and health, but fireplaces should be provided not only for the convenience of the camper, but for the protection of the forests from fire which so often originate from camp fires left burning in the open.

Of particular interest and importance is the camping situation in the Tuolumne Meadows. The number of campers utilizing this area for camping purposes annually runs into the thousands, often times as many as 500 camping there at one time. Without sanitary facilities of any kind and relatively little supervision, a very unsatisfactory condition exists, which is becoming worse with the increase in the use of the area from year to year. The camping situation here is nearly as important as that in the Yosemite Valley itself and should be given similar attention. Sanitary conveniences should be provided, a systematic method of garbage disposal should be installed, and a small supervisory unit should be stationed there to see that reasonable rules of health and sanitation are followed. To do all this means the erection of buildings for the men for use as quarters and mess purposes and the installation of water and sewerage systems for their use.

The great demand for camping space within the Mariposa Grove of Big Trees makes consideration of this proposition also an important one in the camping game. Heretofore camping has always, even when under State administration, been prohibited in the grove. It is my understanding that danger of fire has been the reason for this prohibition, and the reason was undoubtedly well founded in earlier times. However, since the underbrush has been removed from the vicinity of the giant trees, and with the more careful supervision it is possible to give at the present time the danger of fire is so relatively small as to be left out of consideration.

I do not mean to infer that camping should be allowed indiscriminately throughout the grove, for such would be little short of desecration, but I do recommend the preparation of a public camping ground in the lower grove near the ranger station, where close supervision could be given and where the proposition should be limited, possibly both as to the number of people and the length of stay as well. These grounds should be provided with the necessary sanitary provisions, water supply, and fireplaces.

HOTEL AND CAMP ACCOMMODATIONS.

As was the case last year, the current season saw a period of exceeding congestion, due to lack of hotel and camp accommodations, as well as an unprecedented shortage in camping equipment for rental. Inability to supply the demand makes it necessary to advertise widely that for such and such a period no accommodations are available except where confirmed reservations are held and even that for safety campers should bring their own equipment. While this is all right for the operators at the time, its aftereffects are well-nigh deadly as the idea of congestion distributed State-wide prevails, even weeks after the shortage has passed, and it is not unusual as late as the end of August to see people, who would much prefer the comfort of a hotel or hotel camp to a camp in the open, arriving with their expensive powerful car loaded to the gunwales with camping equipment, under the impression that in no other way can they be accommodated in the park.

The need for a good, comfortable hotel in Yosemite Valley to replace the present barn-like structure, utilized for that purpose, is too well known to need further comment, and it is to be hoped that the prices for labor and materials that go into construction may soon reach a reasonable level where such an undertaking would be justified.

More of the hotel-camp type of accommodations are also required, but the most crying need of all is additional housekeeping-camp facilities. Here the demands are far greater than for any other type of accommodation, and I am not sure that the solution is not in the erection of permanent housekeeping cabins to take care of general demand supplemented by the movable-tent equipment to carry over the peak of the season. June and the greater part of July is the critical period, a period of not more than six weeks—not long enough to warrant the heavy investment of permanent buildings, but still a period that it is very important be provided for. Light canvas equipment easy to move would probably best meet the requirements.

YOSEMITE FREE NATURE GUIDE SERVICE.

Dr. H. C. BRYANT, in charge.

I submit herewith the first annual report of the Yosemite Free Nature Guide Service.

HISTORY AND PERSONNEL.

Several persons and organizations were instrumental in bringing about the free nature guide service instituted in the Yosemite National Park during the summer of 1920. Work of a similar nature was carried on by the State fish and game commission at Lake Tahoe resorts during the summer of 1919. The California Nature Study League was in part responsible for that undertaking and also for the Yosemite work.

The interest of the Director of National Park Service in the starting of a nature guide service in Yosemite led him to ask the fish and game commission to cooperate sufficiently

in the project to pay the salary of Dr. H. C. Bryant, who was asked to take charge of the work, it being understood that the National Park Service or private subscription would care for his expenses. This cooperation having been secured, work was begun on the 1st of June, and the services of Dr. Loye Holmes Miller, of the southern branch of the University of California, secured to help with the guide service from June 15 to July 15. One other person, Mrs. Enid Michael, aided by taking charge of the flower show and also substituted on some of the field trips.

PLAN OF WORK.

The aim of the nature guide service was to furnish useful information regarding trees, wild flowers, birds, and mammals and their conservation and to stimulate interest in the out-of-doors, and particularly in the natural objects found in the Yosemite National Park. Behind this aim was the conviction that the person who knows something about what he sees and hears more greatly enjoys his vacation. The means utilized to attain this aim were as follows:

1. Trips afield where visitors might attain first-hand information regarding the living things of interest to be found along the trail side.
2. Lectures and camp-fire talks, designed to awaken interest in birds, trees, and wild flowers and to convey information useful on a summer vacation.
3. An office hour at which time the usual questions of the vacationist regarding natural history could be answered.
4. A set of dependable reference works made available to everyone.
5. A flower show where the commoner wild flowers properly labeled were displayed.

FIELD TRIPS.

The following schedule of field trips was arranged:

Adults, Camp Curry, Monday and Wednesday, 8 a. m.; Sentinel Hotel, Tuesday, 8 a. m.; Yosemite Lodge, Wednesdays and Fridays, 8 a. m.; special excursions for children, Camp Curry, Mondays and Thursdays, 3.30 p. m.; Yosemite Lodge, Wednesdays and Fridays, 4 p. m. Saturdays and Sundays were utilized for longer excursions. On several different occasions a nature guide went along with scheduled excursions to such points as Clouds Rest, Merced Lake, Tenaya Lake, and Pohono Trail. These back-country excursions appeared to be particularly profitable, not only because of the type of people met with but also because of the interesting plant and animal forms seen. Several times there was call for a nature guide to accompany some private party who could not arrange to go on the scheduled trips.

Although it was impossible to furnish very much information which could long be retained by those attending the field trips, yet it was possible to wake them up to possibilities and to demonstrate that they were passing every hour many objects of interest. It was usually possible to show the classes, in an hour and a half's excursion, 15 to 20 varieties of birds, about 20 kinds of wild flowers, and some 10 or 12 trees and shrubs. During the nesting season it was not uncommon to discover five or six different birds' nests on a single excursion. All three of the different pines found on the floor of the valley could be shown and a demonstration made as to the means of identifying each by needles and by the bark.

Interest in these field excursions was very keen, and although, as a rule, because of very short stays in the valley, persons were unable to attend more than once or twice, there were some who attended the trips regularly for a week or two at a time. On two or three occasions it was necessary to divide the class into two sections because of the large attendance. The attempt was made to limit the classes to 20, as this is the maximum number that can be cared for.

The children's excursions seemed to be particularly worth while. Great was the children's enthusiasm at all times, and especially so when an ant lion was dug from his den, or a larva uncovered from his little house which we call a gall. It was found that the children assimilated the information given them much more rapidly and retained it better than did the adults. It seems also that the interest stimulated will be more lasting and more worth while in the case of children. The attendance in the children's classes was rather disappointing during part of the season, due, we think, to insufficient advertising in the valley.

The following is a summary of the attendance:

Field trips attendance.

Month.	Number of trips.	Adults.	Number of trips.	Children.
June.....	28	424	7	66
July.....	27	484	10	183
August.....	14	175	7	67
Total.....	69	1,082	24	299

Total attendance, 1,381.

LECTURES AND CAMP-FIRE TALKS.

Both formal lectures and informal camp-fire talks were included in the lecture schedule. An illustrated lecture and one camp-fire talk were scheduled at both Camp Curry and Yosemite Lodge each week, and a short talk was given in connection with the motion-picture show in the village. Motion pictures were utilized to illustrate many of the lectures at Camp Curry; but suitable equipment being lacking at the Lodge, a stereopticon was used instead. These lectures and camp-fire talks were favorably received, and we

believe they did much to break down the hysteria which goes along with the sight of a snake and the many myths which have grown up about the more unusual birds and mammals, as, for instance, the story that a bat dives into ladies' hair and that a porcupine can throw his quills. Furthermore, these lectures helped to answer questions regarding certain birds, animals, and trees which the visitor had met on coming into the park.

The attendance was as follows:

Month.	Formal.	Camp fire.	Attendance.
June.....	8	12	10,815
July.....	10	11	10,287
August.....	6	7	4,650
Total.....	24	30	25,752

SUBJECTS.

Lectures.

Bird migration in California.
Fish and fishing.
Wild life conservation.
Bird music.
Predatory mammals.
Distribution of plants and animals.
Our national parks.

Nesting waterfowl.
Camouflage in nature.
Instincts and habits of birds.
Common birds of Yosemite.
The game mammals of California.
Instinct in birds.
Common wild flowers of Yosemite.

Camp-fire talks.

The nature guide service.
The mountain lion.
The black bear.
The Douglas squirrel.
The big trees.
The water ouzel.
The band-tailed pigeon.
The snow plant.
The coney.
The harlequin duck.
The rattlesnake.
Toads, frogs, and salamanders.

The weasel.
Snakes and lizards.
Common wild flowers.
Predatory animals.
The owls.
Relation of birds to insects.
The canyon wren.
Bats.
Life zones.
The mule deer.
The geology of Yosemite.

Fortunately, the lectures of the Le Conte memorial service were on natural history, and the nature guide service centered its energies on these lectures during the period when they were given, even postponing service lectures to help build up attendance.

OFFICE HOURS.

Probably the commonest question asked the nature guides was:

"What bird is it that has a red head, yellow breast, and black wings?" Did the person asking the question not meet some one who knew that this bird was a western tanager, he would lose the opportunity of being set right as to the bird's name, and furthermore would miss the thrill accompanying the securing of this knowledge. Another common question was, "What is the small brown animal with black tipped tail, which is often seen around our camp?" The information that this animal is known as a weasel and that it preys upon small birds helps to make a summer vacation more worth while.

Such were the questions and the information given during the office hour held each day between 10.30 and 11.30 a. m. at the National Park Service office.

During the height of the season one nature guide could well be kept busy answering questions. It was estimated that on some days 50 to 75 people made use of the opportunity of consulting some one acquainted with natural history.

FLOWER SHOW.

Many favorable comments have been made on the flower show, arranged in front of the National Park Service office. Mrs. Enid Michael, of the California Botanical Association, kindly offered to take charge, and the success of the exhibit was largely due to her interest and hard work. Branches with cones of the various coniferous trees were on exhibition, as well as the different wild flowers in season. As a rule, between 80 and 90 different varieties were on display at one time, and more than 400 different species of wild flowers were exhibited during the season. It was estimated that during the height of the season from 300 to 500 persons daily actually utilized the exhibit. They noted carefully each flower and read the labels. Through the kindness of friends it was possible often to have on display some of the more interesting wild flowers from the higher elevations, such as heather, cassiope, and polymonium.

REFERENCE WORKS.

Through the cooperation of the California Nature Study League and the fish and game commission, it was possible to place a small natural history library at Le Conte Lodge and another one at the National Park Service office in the village. Books on birds, wild flowers, insects, trees, fish and game, etc., were made available to everyone. In addition a wall rack containing colored pictures of birds, mammals, and fish proved a great attraction.

PUBLICITY.

It was evident that the newspaper publicity instituted in preparation for the nature guide service was very worth while, for many persons made investigations upon reaching the valley because they had read of the work in their home newspaper. Through the cooperation of the Nature Study League, a newspaper item advertising the nature guide service in Yosemite was issued each week from early March through August.

Attractive posters, with a colored picture of a mountain quail, were placed in conspicuous places in the valley, and to each was attached a schedule of the field trips and lectures. Several items relating to the service were published in the Stentor's Call, issued daily at Camp Curry. Arrangements were also made whereby there appeared on the back of the menus at Yosemite Lodge and the Sentinel Hotel some nature notes, together with a short statement regarding the nature guide service. This proved to be a splendid means of publicity and at the same time must have helped in spreading information regarding the natural history of the park.

COOPERATION.

Splendid cooperation was received from everyone in the valley. Both the Curry Camping Co. and the Yosemite National Park Co. appeared eager to schedule the evening lectures and to do all that was possible to make the work a success. The Yosemite National Park Co. was also good enough to furnish a pass which entitled the holder to needed accommodations and transportation.

OTHER ACTIVITIES.

The nature-guide service attempted to add to the stock of scientific information as regards the fauna and flora of the park. Particular attention was paid to the present status of animal life so that some basis may be had for estimating increase or decrease.

Of particular interest this year was the presence in the Merced River of a pair of harlequin ducks. This pair of birds was seen by many different people during the latter part of May and the first part of June. During the first part of August, only the female was seen, but no young birds were discovered. This duck happens to be one of the rarest ducks in California, and the nest and eggs of this bird have never been found in this State, although it has been known for some time that the bird nests along rushing mountain streams in the Sierra.

A number of birds usually restricted to lower elevations have been noted on the floor of the valley during the month of August, notably the California blue jay, the black phoebe, and the bush-tit. It was also noticed that after each storm, birds from higher elevations, such as the Pacific nighthawk and the olive-sided flycatcher, appeared on the floor of the valley. The nests of a number of interesting birds were discovered, including those of the hermit warbler, belted kingfisher, canyon wren, and trail flycatcher.

RECOMMENDATIONS.

As a help to anyone who may continue nature-guide work, either in Yosemite or in other parks, we offer the following recommendations:

1. Lectures should precede field trips at the different resorts, so that the lecturer can advertise a field trip for the following morning. This would greatly increase attendance.
2. It was found that campers often felt out of place meeting at Camp Curry and at the Yosemite Lodge, consequently it might be well to establish a meeting place among the camps and conduct a special trip especially for campers.
3. The schedule as arranged this year is rather a heavy one for a single guide to handle. The schedule used could have been handled much better if two guides had been present the summer through. There is considerable nervous energy expended in handling two field excursions in the daytime, holding an office hour, and lecturing again at night.
4. Sentinel and other near-by meadows were mowed for hay during the latter part of July, thus destroying a wonderful display of wild flowers. There is great danger in the cutting of such wild flowers as the Mariposa lily, and if this is continued these meadows will become as barren of wild flowers as is the meadow near Kennyville which is cut regularly. We are confident that these meadows are worth more as an object of beauty than as a source of hay.
5. Mr. Curtis, of the Curry Camping Co., suggests that a much better poster could be arranged. The criticism of the present one is that there is too much printing on it.
6. So great has been the interest in the flower show at the National Park Service office that it might be well to arrange another display at Camp Curry. Doubtless many persons who never visit the village would utilize a flower show at the other end of the valley.
7. It seems possible that the nature guide might well organize an evening trip to the bear pits, say, once a week.
8. The nature-study notes appearing on menus could be improved, and similar notes should appear on the menus at Camp Curry.
9. It was found that what little publicity was given the nature-guide service in the valley was sufficient to furnish all who could be handled on the field trips. Additional publicity would certainly increase attendance. Many persons stated that they would attend the natural history lectures regularly if they knew the exact time and place, consequently more publicity in this direction might have been worth while.
10. It appears, also, that there might be some correlation work done between the different projects in the valley which have some relation to the nature-guide movement. Mr. Pillsbury's wild flower pictures are wonderful and everyone interested in natural history should be urged to see them. The guide who talks to the crowds on sight-seeing busses could be urged to furnish dependable scientific information on the natural history subjects. Mr. Foster Curry often gives talks on the geology and natural history. These and other features might well be correlated with the nature-guide work.

CONCLUSION.

Certainly the interest shown in the nature-guide service has demonstrated that it is needed. The response has been so great that we are sure there will be sufficient demand not only to continue the work in Yosemite National Park but to extend it to other parks.

Everyone has been greatly interested in this beginning of a new movement, and without doubt many letters will be sent to the National Park Service making favorable comment on the project. Certainly the attendance at the more formal lectures and on the field excursions, which have been purely optional, have far exceeded our expectations, and it would have taken but a little more advertising to have made the figures even larger. But rather let others who came in contact with the nature-guide service give it praise.

SEQUOIA AND GENERAL GRANT NATIONAL PARKS.

JOHN R. WHITE, superintendent, Three Rivers, Calif.

GENERAL STATEMENT.

The Sequoia and General Grant National Parks were created by acts of Congress October 1, 1890. The Sequoia National Park is 252 square miles in area and is entirely within Tulare County, Calif. The General Grant Park is 4 square miles in area and is partly situated in both Fresno and Tulare Counties.

Exclusive jurisdiction over these parks was ceded by the State of California to the United States on April 15, 1919. An act of Congress, approved June 2, 1920, accepted this jurisdiction, and Mr. Walter Fry, for many years superintendent of these parks, was appointed the first United States commissioner for the territory he so ably administered as an executive officer.

The Sequoia National Park derives its name from the groves of big trees (*Sequoia washingtoniana* or *gigantea*) the preservation of which was the motive for its creation. The General Grant Park bears the name of the largest sequoia in that grove.

However, the big trees are but one of the many attractions these parks so lavishly afford. In the Sequoia are mountains, lakes, rivers, limestone caves, meadows, and every combination of scenery and opportunity for outdoor life, with the complement of a perfect summer climate. Grant Park, though small in area, affords camping under the big trees and is the gateway to as fine alpine scenery as exists in the world. It is conceded by experienced mountaineers that no where can the high Sierra be so easily reached as through these pleasant parks, where trails lead on easy grades out of the orange and lemon groves, the fig and apple orchards, and the vineyards of the San Joaquin Valley into the chapparal and chamise and manzanita clad foothills; up to the black-oak and deciduous belt and on to the mighty forests of sequoia, fir, and pine; then on, ever on and up, through green and flowery meadows to the granite backbone of the range where Foxfall pines straggle up the last slopes to the perpetual snows of the high Sierra peaks.

These parks are situated midway between San Francisco and Los Angeles, and are nearer to the rapidly growing population center of the latter town than any other national park. They are the natural playground of the largest and most fertile valley of California, the San Joaquin. Their development should keep pace with the growth of these communities; and while their present area may seem sufficient for the needs of the tributary population, it requires little imagination to foresee the day, and an early day when a greater area will be necessary.

PROPOSED ROOSEVELT-SEQUOIA NATIONAL PARK.

This greater area is provided in the bills now before Congress to create the Roosevelt-Sequoia National Park by adding to the Sequoia some 1,300 miles of mountain territory, thus protecting it for all time against exploitation and holding it in fee for the people of the United States. This additional area includes the highest mountain in the United States exclusive of Alaska, Mount Whitney, 14,501 feet, as well as many groves of these irreplaceable heirlooms, the giant sequoias, with glaciers, lakes, mountain valleys, and peaks—an outdoor paradise whose winter climate precludes cultivation but the summer climate of which makes it ideal for outdoor recreation and nature study.

DEVELOPMENT OF THE SEQUOIA.

A combination of circumstances has hitherto prevented the full development of the Sequoia National Park as America's greatest playground—illogical administration of a civil reservation by Army officers and policing by soldiers changing from year to year; bad roads and prohibition of motor travel; the World War; lack of advertising as compared with European, Canadian, and other American resorts, all have retarded the natural progress of the park. With these obstructions removed, with an efficient organization under the National Park Service and with congressional appropriations commensurate with the capital value of the park, the population served, and the revenues received, progress should be rapid.

ADMINISTRATION AND PROTECTION.

On July 15, 1920, I relieved Mr. Walter Fry as superintendent. Judge Fry's resignation as superintendent and appointment as United States Commissioner for Sequoia and General Grant National Parks was the subject of much laudatory comment in the press of the San Joaquin Valley. During his 20 years' service he had endeared himself to all visitors and employees, and his generous attitude toward me as well as his support and advice have been invaluable.

Personnel.—The permanent force for the administration and protection of these two parks consists of but 5 men—1 superintendent, 1 chief ranger, 2 assistant chief rangers, and 1 ranger. The inadequacy of this force to protect and develop 256 square miles of territory, patrol over 100 miles of roads and 250 miles of trails, and serve over 60,000 visitors annually must be apparent.

Ranger force.—During the summer nine men were employed as temporary rangers, but this arrangement is unsatisfactory and does not enable the organization of a fully efficient administrative body. The time has now come when a larger permanent ranger force should be authorized. These men can be kept fully employed during winter at the lower levels of

the parks, and the additional expense would in the long run be little. In fact, their replacement of laborers on road and trail work would prove an immediate economy.

As a dollar and cents matter alone an increased force with increased pay and certain pension will save money in actual cash expended; while the prospective saving to the Nation by having these noble parks cared for by a body of trained and well-paid men rather than by untrained and temporary laborers should appeal to a business administration.

Manual for rangers.—A manual of instructions for rangers is needed in which their duty to the service and to the public is clearly set forth, together with all laws, rules, and regulations affecting the park service and a compendium of useful general information.

JURISDICTION OF OFFENSES.

The appointment of Mr. Walter Fry as United States commissioner for Sequoia and General Grant National Parks, together with the cession by the State of California of jurisdiction therein, will result in a vastly increased measure of protection for the wild game, the sequoias, other trees and shrubs, the flower-strewn meadows and hill-sides, the caves, and other natural beauties. It is now possible for the administrative agency to apprehend an offender and promptly secure his punishment. Heretofore vandals have gone practically unpunished, even for killing deer within the park.

One case, unauthorized entrance to Crystal Cave, was referred to Judge Fry and dismissed on his advice. Another case, speeding, which caused accident amounting to approximately \$100 damages to the park service Studebaker truck, was tried before Judge Fry and the defendant was fined \$150, which he paid.

REVISION OF PARK RULES AND REGULATIONS.

It is felt that some revision of park rules and regulations is necessary, as well as their publication in a form more readily digested by the average visitor than in the information pamphlets where they are buried among descriptive matter. Every visitor, on entering the park, should receive a copy of the rules and regulations from ranger at checking station, and it should be presented in such striking and attractive form as to awaken interest and attention. The embodiment of exemplary cases, showing punishment given past infractions of rules, is suggested. A synopsis of the rules should appear on large signs at park gateways, ranger stations, and elsewhere.

Some provision should be made for the issue by superintendents of special regulations from time to time which should have the force of those authorized by the Secretary of the Interior. It may become necessary for the superintendent, during the season, to close creeks to fishing, roads, trails, or natural objects to travel or access, and the inclusion in present rules and regulations of a paragraph worded as follows would be of administrative assistance: "Special regulations issued by any park superintendent at any time shall have the force of general regulations pending approval by the Secretary of the Interior, and violation of the same shall be punished by similar fine or imprisonment or both, viz, not to exceed \$500 fine or six months' imprisonment.

WEATHER.

The summer of 1920 was continuously fine until August 23, when there were four days of rain and mist. With this exception, light rain fell on only a few days during the season. Very few thunderstorms occurred. The long hot spell in the San Joaquin Valley, 23 successive days on which the thermometer exceed 100°, drove many to the parks.

The institution of a proper system for recording maximum and minimum temperatures, rain and snow fall, and other meteorological data is a necessity. Request to the Weather Bureau for the necessary instruments has been made. The day is not far distant when the Sequoia National Park should be open the year round, and to make this possible the exact recording of both winter and summer temperatures should be made.

It is reported that the winters at Giant Forest are generally delightful, occasional snowstorms being succeeded by sunny days when the thermometer is about at freezing point and the air like wine. Tentative plans have been made to spend a real old-time Christmas at Giant Forest this year, and a number of employees, public operators, and visitors have signified their intention to ski, snowshoe, and jollify at that time unless insuperable weather conditions prevail, which is improbable.

ENGINEERING AND CONSTRUCTION.

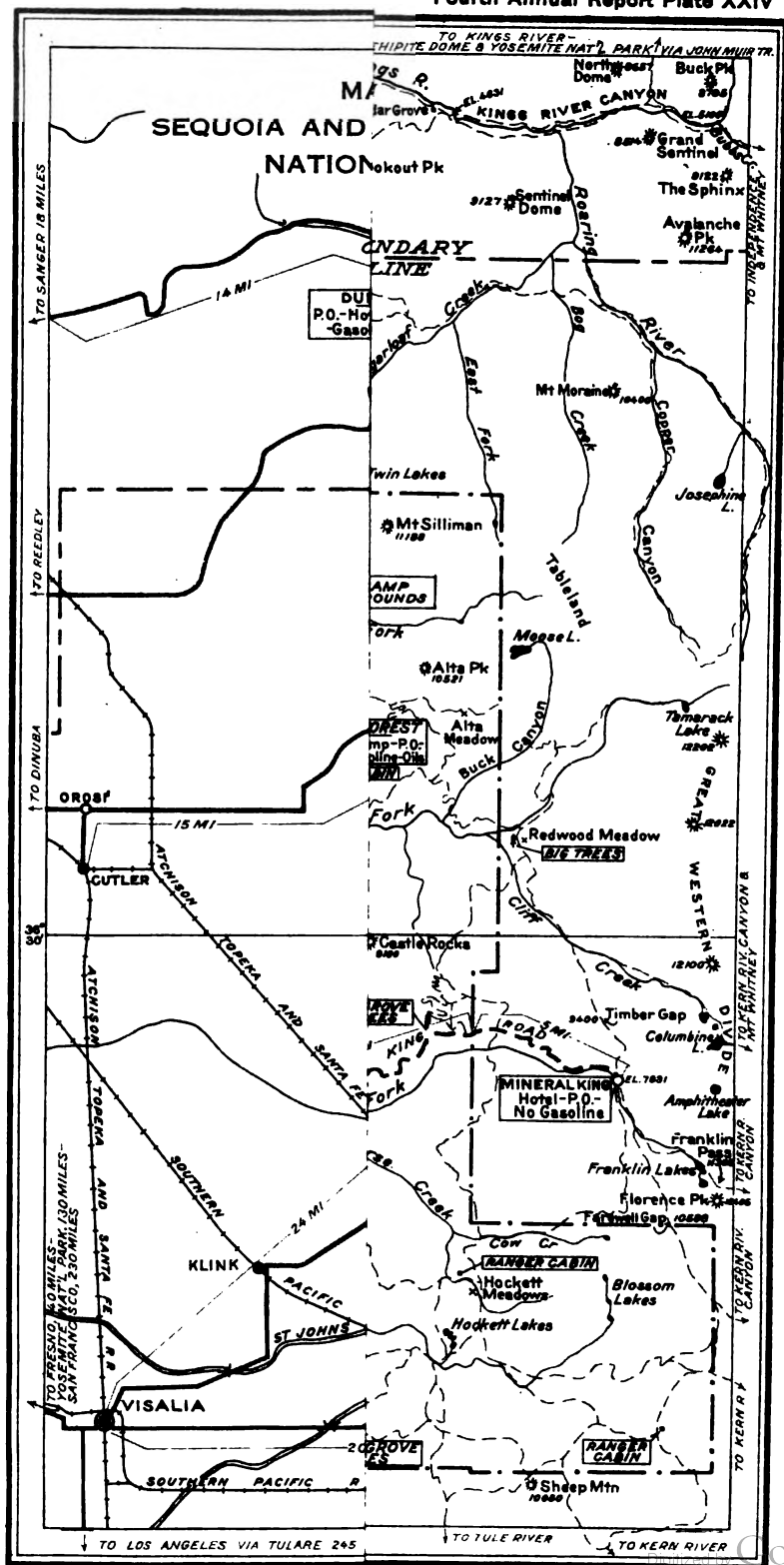
ROADS.

Giant Forest Road.—The bad condition of the Giant Forest Road between park boundary and Three Rivers has done more to deter visitors than any other one thing. Seven miles of this road are narrow, steep graded, with sharp turns, deep rutted and rocky. Within the park the Giant Forest Road is in fair condition and is being constantly improved. The board of supervisors of Tulare County have allotted \$15,000 for repairs to the county section and will probably make further allotment. It is confidently expected that the opening of 1921 season will see a good road from Three Rivers to Giant Forest, 30 miles.

Middle Fork Road (Elk Park Road).—This road for 7 miles from Alder Creek entrance to beyond Hospital Rock is in good condition. Hitherto it has been maintained by the Mount Whitney Power Co., but with its prospective extension of 10 miles to Giant Forest up the slopes below Moro Rock the existing section will be maintained by the park service.

In the estimates for 1922, \$100,000 was requested for the 10-mile section from near Hospital Rock to Giant Forest and is a moderate estimate, considering the amount of solid rock work to be encountered.

This is the scenic route to Giant Forest, the Kaweah Peaks, with Moro and Castle Rocks being always in view. The State will build a concrete highway to park en-



trance near Alder Creek, and when completed the Middle Fork Road will be the "front door" to the Sequoia National Park, and the Giant Forest Road will be the "back door"; both are as necessary to the park as to a residence. When both roads are completed a system of one-way travel will make it possible to travel faster and with less risk.

Mineral King Road.—This is a county road which passes through the narrowest part of the Sequoia Park, 14 miles, and is now in very bad repair, no steps being taken by the county for its repair. It leads to the old mining settlement of Mineral King, a fine gateway to the High Sierra country beyond. If the park is enlarged to include this territory steps must be taken to rebuild this road, as Mineral King is now visited by hundreds of summer campers and can be developed into a most attractive resort.

Sequoia-General Grant Road (21 miles; 5½ miles constructed).—So far as constructed, 5½ miles from Giant Forest to Marble Fork River, upper crossing, the road, which passes the Sherman Tree and Wolverton Camp, has been known as the Marble Fork or Wolverton Road. It is being extended in a small way to camp sites up and down the Marble Fork, and should be pushed on toward General Grant Park when funds are available. Apart from its desirability as a link between the parks, it will open excellent camping ground at Willow Meadows, Clover Creek, etc., and afford better access to Twin Lakes, a necessary rounding out of Sequoia Park attractions.

Short roads around Giant Forest (8 miles).—The Beetle Rock, ½ mile; Sunset Rock, 1 mile; Moro Rock, 2 miles; Parker Group, ½ mile; Circle Road, ½ mile; miscellaneous around Giant Forest camps, 3½ miles, are constructed and heavily patronized. A spur of three-fourths mile from Parker Group to Crescent Meadows is half constructed, and when finished will open the most beautiful of meadows and a lovely creek, Log Meadow Creek, as well as a view of the Sierras from Kaweah Vista.

TRAILS.

There are about 250 miles of trails in the Sequoia and 12 miles in General Grant Park, all of which are in good condition, although parts will need much work this fall and next spring.

As the greater number of visitors have only a limited time in the park, the development of a system of good foot and horse trails in and around Giant Forest is of importance and has been begun. A circular trail leading from the Alta Trail to Circle, Log, and Crescent Meadows and return to Giant Forest is finished, and loop trails to points of interest are being connected with the system. Many visitors have already profited by these short trails and expressed their appreciation. A good trail map of Giant Forest surroundings on large scale and adapted to tourist use is urgently needed, and it is hoped may be prepared in time for use next season. The United States Geological Survey map is too detailed and on too small a scale for general use.

A desirable innovation would be the posting of a large-scale map, say, 6 or 12 inches to the mile, under glass cover on a bulletin board at Giant Forest ranger station.

The landscape treatment of Giant Forest and surroundings by a system of trails up creeks and around meadows, with graceful bridges and restful seats at intervals, is a prospective work that should delight the heart of a landscape engineer. To one who has seen the possibilities of such treatment as carried out in Japan, or on large estates in America, the problem of harmonizing work among the Sequoias with the forest growth and California climate is indeed attractive.

TELEPHONE LINES.

There are 118 miles of telephone lines in Sequoia and 1½ miles in General Grant Park. One No. 9 ground-circuit line from Giant Forest to Three Rivers, installed in 1919 at a cost of approximately \$2,000, against the advice of my predecessor, has never been of use and must be placed on a metallic circuit owing to the induction from the Mount Whitney power plants near Three Rivers.

The increasing business over the Three Rivers-Giant Forest line will make it necessary to install a central at Giant Forest before next season, and to separate the general public and hotel business from that of the park service.

Construction is proceeding on line from Giant Forest to Grant Park and will be completed to Clover Creek and to park boundary at Cabin Meadow (13 miles) before the end of September, 1920. Authority has been received from the forest supervisor to extend this line across the forest reserve via Woodward Meadows and Quail Flats to General Grant Park.

"A little fire quickly is put out, which being suffered rivers can not quench."

Adequate telephone communication is the cheapest insurance against forest fires. It reduces the number of rangers needed for patrol purposes and enables the superintendent to use his force to best advantage.

In all probability it will soon be necessary to use one of our Giant Forest-Three Rivers telephone lines as a telegraph line and have the Western Union open an office at Giant Forest.

BUILDINGS.

The construction of a superintendent's residence and an administration building at Giant Forest, long needed, awaits final approval of the plans.

The provision of adequate quarters for park officers and employees is believed to be as important as any other matter confronting the superintendent. During the summer season all employees are hard worked, and their women folk particularly need the ordinary comforts of a civilized home, which include a bath and hot and cold running water. Camping is fun for those who live the year round under comfortable conditions, while campers can devote their whole time to chores. But the man who returns from fighting fires or attending for 14 to 16 hours at a stretch to the demands of visitors needs home comforts and a satisfied wife at the door.

Funds have been requested in 1922 estimates for construction of quarters for rangers, other employees, and laborers. In addition, under miscellaneous construction,

we shall need additional garage, machinery, carpenter and paint shop room, storehouse, etc., much of which it has been difficult to estimate. Ample shop room for machine and carpenter work means ultimate saving to the Government. Already we have a paint shop turning out signs which are a great economy over those heretofore painted in Visalia.

WATER SUPPLY.

The present system, which is the patchwork growth of years, is proving inadequate to demands. Estimates of \$28,000, based on survey by engineer of United States Public Health Service, have been submitted and will put in a new 4-inch main from Wolverton Creek which will satisfy needs for many years.

SANITATION.

A survey by engineer of the United States Public Health Service has resulted in estimates of \$75,000 for a modern septic tank sewage system with groups of toilets and bathhouses which will care for a population at Giant Forest of 2,000 average daily. Our 1920 daily summer population has been about 1,000. Future Giant Forest population can be kept down to the limits of the proposed sewer system by sending temporary campers to outlying camps.

The present system of toilet and garbage pits is offensive and unsightly. Temporary measures will alleviate conditions next season; but Giant Forest is now, in summer, a little town and must be provided with ordinary urban conveniences.

SIGNS.

Much inconvenience has been caused visitors by lack of signs on roads and trails which requires attention.

It would seem essential that all roads and trails be marked by temporary signs pending erection of permanent ones. We have used to advantage a small rubber printing outfit with 1-inch letters, and have also made a hundred or more signs of redwood or pine boards painted in green letters. These are effective and quite suitable pending permanent signs. During the formative period of a park there are even advantages in the use of temporary signs, as trails and roads change and signs must change with them.

LIGHTING SYSTEM FOR GIANT FOREST.

With the ever-increasing number of visitors, Giant Forest village needs an electric-lighting system. Apart from its evident utility, the nocturnal beauty of the camps will be much heightened by proper distribution of lights, which should be placed in hanging frames or on natural wood stand in harmony with the forest surroundings. A treatment such as is seen at Nikko and other places in Japan where the lights are incased in stone temple lanterns might be tried.

On the economic side it seems unworthy of a practical and ingenious people to use the lights of the dark ages—candles and oil lamps—when near-by streams are wasting thousands of kilowatts of convertible electricity. A small plant, 10 to 50 kilowatts, could be installed cheaply enough on the Marble Fork or Wolverton Creeks and could light both Crystal Cave and Giant Forest. Figures are being obtained as to the cost of such a system.

An appropriation estimate of \$2,500 for moving the old Yosemite system to Giant Forest was not acted upon by Congress, and if the Yosemite has outgrown its plant it is thought that it would not long meet the growing demands of Giant Forest and vicinity.

TRAVEL.

Travel to Sequoia National Park for the 1920 season amounted to 31,508 visitors, an increase of 1,065 persons over the 1919 season, which was the previous record travel year. Five thousand six hundred and fifty-seven automobiles entered the park during 1920, as compared to 8,852 in 1919, an increase of private automobiles entering of 1,805 machines. The public operator also showed a very material increase in the number of passengers handled during the past season, 655 persons having made the trip in the public stage as compared to 292 persons in 1919.

While General Grant also had a very fine travel season, there has been a slight decrease in travel this season, 19,661 persons having visited this park, as compared to the 21,574 persons visiting the General Grant Park in 1919. However, there has been an increase in the number of private automobiles entering the park, 4,710 automobiles entering as compared to the 3,366 machines entering in 1919. The public operators also had an enlarged and increased patronage. The Kings River Stage & Transportation Co. handled 263 passengers from Fresno and Sanger to the park, while W. M. Collins handled 86 passengers from Visalia to the park, making a total of 349 visitors using the authorized public stages, as compared to 174 persons availing themselves of this transportation service in 1919.

Considering the bad county section of Giant Forest Road; the lack of advertising the Sequoia Park has had compared, for instance, with Yosemite, Yellowstone, or Grand Canyon; and the lack of direct service with Visalia or other railroad center, the 1920 figures are a tribute both to the inherent attractions of the parks and to the administration of my predecessor, Judge Fry. With the removal of one or all of the deterrent factors, it is confidently expected that travel figures will rapidly double or treble and the public of California and the United States obtain full benefit from these glorious playground.

Active steps have been taken, in cooperation with the Kings River Parks Co., the boards of trade of Tulare County and of Visalia and other valley towns, and with the press of the San Joaquin Valley, to present to the public the great gifts offered by these parks.

Sequoia National Park.

	Autos.	People.
Passengers carried by Sequoia National Park Stage Co.		655
Making entrance with private automobiles, paid and complimentary, and on those roads where no fee is exacted.		28,538
With other private transportation, as wagon, horse, or on foot.		4,315
Grand total.		31,508
Travel by different entrances:		
Giant Forest Road.		11,606
Elk Park Road.		9,483
Mineral King Road.		8,826
Trails, all sources.		1,593
		31,508
Private auto travel:		
Entering via Giant Forest Road.	2,489	10,044
Entering via Elk Park Road.	1,901	8,576
Entering via Mineral King Road.	1,267	7,912
Other transportation as above.		4,970
Total.	5,657	31,508

General Grant National Park.

	Autos.	People.
Transported by Kings River Stage & Transportation Co.		474
Making trips with private transportation, automobiles, paid and complimentary.		18,040
With other transportation, wagon, horse, or foot.		1,147
		19,661
Travel by different entrances:		
South.		18,791
West.		661
Trails, all sources.		209
		19,661
Private auto travel:		
Entering from west.	81	325
Entering from south.	1,629	17,715
Total.	1,710	18,040

AUTOMOBILE FEES.

A fee of \$2.50 is charged for the automobiles entering Sequoia by the Giant Forest Road and \$4,586.75 was collected. Fifty cents is charged on each automobile entering General Grant Park and \$2,045.27 was collected.

SERVICE TO THE PUBLIC.

TRANSPORTATION.

From Lemon Cove to Giant Forest, Sequoia Park, a daily stage for passengers and freight is run by the public operators, Askin & Overall, and has given satisfaction. When the condition of the road is considered, the service given and freedom from accident or discomforts reflects great credit on the operators and employees, who have been uniformly courteous and obliging. The stage carried 655 passengers and 248,396 pounds of freight; also bringing and taking mail, which is considered below under "Mail service."

From Fresno and Visalia to General Grant Park the Kings River Stage & Transportation Co. and W. M. Collins, respectively, carried 203 and 86 passengers and 194,853 and 6,000 pounds of freight.

There is urgent need of direct stage from Visalia, the natural valley headquarters for Sequoia, to Giant Forest, and it is hoped that present objections to this may be overruled by representations to the Visalia Electric Railroad Co. that growth of transportation and general development of such a stage route would react favorably to the electric railway.

AEROPLANE TRAVEL.

The visit of Lieut. Morgan, United States Army Air Service, to Hockett Meadows and Giant Forest in September has resulted in his promise to land at Mitchell Meadow as soon as permission is obtained from his superiors. The provision of suitable aeroplane-landing fields must be practically considered.

ACCOMMODATIONS.

Hotels.—Both at Giant Forest and General Grant Park hotel accommodations lag behind travel development, being limited to open-air central dining rooms and office and tent sleeping quarters. When the volume of our travel is considered in comparison with other parks or resorts it is clear that the time has come when all classes of visitors should find accommodations to suit purse and tastes. This matter has been taken up with the Kings River Parks Co., and it is confidently hoped that early in next season the necessary improvements will be made. Under the terms of the franchise they may be required. At Giant Forest a comfortable lounging cabin, with big fireplace, is nearly finished and construction of heated cabins to supplant tents are under way. Relations with Messrs. Worth Ryder, Fritzen, and Blowers, of the Kings River Parks Co., have been most cordial and they have cooperated in every way requested.

Other public operators.—Messrs. George F. Belden and Lindley Eddy have permits for conducting photograph galleries and the sale of photographic supplies in Giant Forest. The cordial manner in which they have cooperated in taking photographs requested by the park service and in generously furnishing copies must receive special mention. The park is extremely fortunate in having men of their artistic taste to do such work, while the freedom from rivalry and their mutual desire to serve the public and the park service is much to be commended.

Mr. Byron Allen had a permit to furnish fresh beef to the tourists, public operators, and employees at Giant Forest.

Messrs. Askin & Overall were granted a franchise for operating the stage and freight route from Lemon Cove to Giant Forest, doing business as Sequoia National Park Stage Co.

General Grant National Park.—Mr. H. E. Roberts was granted a permit to conduct a photograph gallery and to sell photographic supplies in the park.

The Kings River Stage & Transportation Co. and Mr. W. M. Collins were the transportation operators.

The public-utility operators had an excellent year, and few complaints were registered by the public.

Camp sites.—Fine sites for semipermanent or temporary campers are available in unlimited number throughout the Sequoia.

At Giant Forest 120 acres are laid out and water piped; at Sherman Tree Camp 4 acres; at Wolverton Camp 16 acres; near Marble Fork Bridge 3 acres; and at Marble Fork Crossing 25 acres; all are available with water supply from creeks.

Besides these laid-out sites there is, of course, the broad expanse of the park, in which those who wish to find more secluded camps may have satisfaction.

No one thing has given the general public more satisfaction than the director's letter of August 24, 1920, authorizing regular visitors to improve their camp sites by the erection of temporary or semipermanent structures. Already we have over 20 applications for such privilege, and this number will soon be increased. These regular visitors come in with the spring thaw and leave with the fall snows; they largely come from the valley towns near the parks, and by their familiarity with park conditions and regulations they form a desirable class which assists in our work.

At General Grant Park room for further development is limited, as compared with the Sequoia, but accommodations for thousands of additional campers may be provided when funds are available for adequate water and sanitary systems.

LECTURES.

Advantage was taken for two weeks this summer of the presence at Giant Forest of Mr. E. C. Jaeger, author of the Mountain Trees of Southern California, to hold camp-fire lectures, at which most interesting talks on the flora and fauna of the parks were given. These were so much appreciated that it is felt they should be a regular part of the summer schedule and an effort will be made to get in touch with suitable lecturers who will give their services for such reward in the way of special privileges that the superintendent can give.

MOTION PICTURES.

The provision, either by the public utilities or the park service, of a motion-picture outfit at Giant Forest and Grant Park is a necessity. While the temporary visitor can find distraction under the sequoias, those who stay all summer, employees and visitors, are entitled to the amusements of mankind. The educational value of the "movie" in furthering interests in the national park and in promulgating the regulations must not be overlooked. No theater is needed under California summer skies—a sheet, some slides and films, and a projecting apparatus and hundreds may be amused and instructed.

INFORMATION SERVICE.

This has heretofore been furnished by one overworked ranger at Giant Forest ranger station, who was given, during the rush season, a boy to assist him in locating campers and giving information relative to trails, utilities, and attractions.

The need of a central booth or office for a bureau of information is keenly felt and will relieve the superintendent's office of much pressure. An effort will be made to provide it for next season.

Complimentary to such information service the erection of handsome, glass-covered bulletin board with a large scale map of Giant Forest and vicinity and a smaller scale but practical map of the park, is under consideration. There is also great need of a pamphlet map or folder giving accurate information about trails and roads, with location of trees and other attractions and synopsis of regulations. The illustrated pamphlet, Rules and Regulations of the Sequoia and General Grant National Park, 1920, uniform with the pamphlets of the other parks, is too large and too detailed for the intended purpose.

MAIL SERVICE.

As there is no contract for mail delivery at Giant Forest, our mails are irregular; and there is no parcel-post service. The postmistress has done her best under trying circumstances and despite much complaint. Information has been requested from the

superintendent of the Yosemite about the mail system there, and the matter of suitable service for Giant Forest will be taken up in a separate communication. Giant Forest is believed to be the only community in the United States of over 1,000 average daily population unserved by mail delivered under contract.

MEDICAL SERVICE AND ACCIDENTS.

Dr. Morton W. Fraser, of Woodlake, near Three Rivers, was camp physician and granted a permit to sell medical supplies at Giant Forest. He gave entire satisfaction and devoted service, cooperating also in sanitary inspection.

No fatal and few serious accidents occurred. One employee and one visitor suffered broken legs; but a number of minor accidents and diseases were treated while the mental comfort to all, and to anxious mothers in particular, owing to presence of a doctor in camp, is of the greatest value. Many people will not visit a resort unless a doctor is available.

BUTCHER SHOP.

A long-felt want at Giant Forest was supplied this year by the sale of fresh beef by Mr. Byron Allen, who runs his cattle in the park and kills at Wolverton Camp. A harmonious and useful sales butcher shop has been erected near the store in a central location where, however, it is not obtrusive.

CHURCH SERVICES.

Only twice during the summer was there a clergyman present to conduct services at Giant Forest. The need of church services is felt by many and the opportunity to conduct them in these cathedral groves of Big Trees should not be disregarded if brought to the attention of religious bodies. Steps are being taken to better conditions next year.

DAIRY SERVICE.

The contract of the Kings River Parks Co. calls for establishment of a dairy at Giant Forest; but they are unable to fulfill this and are willing for other operators to bring in cows.

The irregular delivery of milk by stage route was the subject of much complaint by anxious mothers with nursing infants, and it is very necessary that milk should be provided for the many babies and children who are brought to Giant Forest to escape the heated lowlands. A verbal application for a permit to bring in eight cows and for permission to graze them at Log Meadows has been received and the matter will be submitted later.

MISCELLANEOUS SERVICE.

This office has received many written and verbal compliments on the service rendered to visitors by all employees and on the improvements made and contemplated. Not a single complaint was registered as to treatment received in Sequoia Park.

At General Grant Park there were several complaints but the forced resignation of two rangers has remedied that situation.

GRAZING.

Apart from the usual inevitable complaints relative to cattle straying from one area to another, the grazing of 1,225 cattle by 12 permittees was properly conducted, with a minimum damage to the park so far as scenery and injury to tourist horse feed was concerned.

The purchase of Log Meadow private holding, known as the Tharp tract, will relieve the neighborhood of Giant Forest from the presence of some 50 head of cattle, which frequently strayed into Circle and Crescent Meadows, broke down trails and destroyed wild flowers and the beauty of the meadows.

Following is a list of grazing permittees in the Sequoia National Park:

Cattle permittees.

Name.	Kind of stock.	Number of head.	Season.	Name.	Kind of stock.	Number of head.	Season.
Byron Allen.....	Cattle...	150	4 months.	Ira B. Putnam.....	Cattle...	150	4 months.
J. E. Barton.....	do.....	40	Do.	T. E. Pratt.....	do.....	50	Do.
Judd D. Blick.....	do.....	300	Do.	Ora Welch.....	do.....	50	Do.
Ernest Britten.....	do.....	100	Do.	Chester Wright.....	do.....	25	Annual.
Noel Britten.....	do.....	50	Annual.	Do.....	do.....	40	4 months.
A. R. Cutler.....	do.....	50	4 months.	Total.....		1,225	
Bernhard Mehrtens.....	do.....	70	Do.				
Mehrtens Bros.....	do.....	150	Do.				

PRIVATE HOLDINGS.

Options are held on some of these tracts; others are of little value, but should be secured in general park interests. When it is considered that on the Tharp holdings (now purchased) within a mile or two of Giant Forest some half a dozen deer were killed each season—poor game creatures straying in confidence from their security within the park—the injustice of these holdings, to put it no more strongly, may be imagined.

To the public spirited gentlemen who have raised or contributed the funds for the purchase of these private holdings, all park employees owe debts of gratitude; while the general public for all time will profit in constantly increasing degree.

List of private holdings in Sequoia National Park.

Owner.	Area.	Location.	Status.
	<i>Acres.</i>		
S. Mitchell.....	180	T. 15 S., northeast on Marble Fork.....	Option held.
Mount Whitney Power Co.....	180	T. 15 S., Wolverton Creek and Long Meadow.....	No action.
F. A. Martin.....	640	T. 15 S., Marble Fork bridge.....	Option held.
C. E. Grunsky.....	40	T. 15 S., headwaters Middle Fork.....	Do.
W. F. Dean.....	320	T. 16 S., east central park boundary.....	No action.
L. E. Sherman, A. J. Robertson, and Ira Cressman.....	40	T. 17 S., "Atwells Mills".....	Do.
Conifer Club.....	180	T. 17 S., East Fork of Kaweah River.....	Do.
E. Egley.....	40	T. 17 S., west central park boundary.....	Do.
T. E. Lynch.....	180	do.....	Do.
T. B. Carroll.....	320	do.....	Do.
Ernest Miller.....	180	T. 17 S., East Fork of Kaweah River.....	Do.
H. T. Miller.....	180	T. 18 S., Cahoon Creek (Horse Creek).....	Option held.
Total.....	2,680		

Private holdings on which options are held.....	<i>Acres.</i> 1,320
Private holdings on which no options are held.....	1,360
Total private holdings.....	2,680

FORESTS AND FOREST FIRES.

Considering the dry season and the exceptional hot wave of 23 days when temperatures, even at Giant Forest, exceeded 80°, and which was followed by violent electric storms, we have escaped serious damage. But this is largely due to the devoted attitude of all rangers and laborers who gave unstinted service to put out fires.

The big blaze of July 15, 1920, covering 100 acres near Muir Grove, might have destroyed that arboreal monument but for special efforts of fire-fighting crew. The flames approached within 100 yards of the finest sequoias.

The lack of telephone communication with Cabin Meadows, Clover Creek, and other ranger stations was forcibly shown at this blaze on the Black Oak Trail, and our appropriations have been squeezed to purchase wire and supplies so that the line will be completed before this report reaches the director; 17½ miles of additional line which will protect the Muir Grove and other valuable timber.

The aeroplane forest patrol, despite occasional inaccuracies in reporting location of fires, is of great value. As aeroplane pilots or observers become more familiar with landmarks these errors in location will be corrected.

The forests are in normal condition; sequoias, conifers of all species and other trees and shrubs, are reproducing well. Especially fine crops of sugar pine cones have been produced this year, and the usual economic increase of squirrels may be expected. Young sequoia groves are being marked both for their protection as well as for the information of visitors who may fail to recognize them.

Attention is invited to the following list, which shows in detail the ten fires reported during the 1920 season:

Fire reports.

Date and hour.	Person reporting and place from which reported.	Location given with bearings.	Cause and remarks.
1. July 12, 1920, 9 a. m.	Marble Fork Crossing; by cattleman.	T. 15 S., R. 30 E., sec. 20, on road to Marble Fork, near Wolverton.	Cigar butt; extinguished by Curtis and Webster; little damage.
2. July 15, 1920, 10 a. m.	Derby; aeroplane.....	Panther Creek (error).	Rangers unable to locate fire near Panther Creek.
3. July 15, 1920, 1.30 p. m.	Ranger Purdy; Cedar Creek checking station.	T. 15 S., R. 29 E., sec. 34, northeast.	Lightning; crew sent out 2 p. m.; under control 6 p. m., July 16, 1920.
4. July 16, 1920, 9 a. m.	Ranger Dorr; Dunlap, miles from fire, nearest phone; also cattleman.	T. 15 S., R. 29 E., sec. 16, close to Muir Grove, west of the Gap.	Lightning; Ranger Dorr went in person and handled; reported under control July 17, 1920.
5. July 16, 1920, 2.30 p. m.	Ranger Purdy; Cedar Creek checking station.	T. 15 S., R. 29 E., sec. 17, southwest corner Pine Ridge.	Lightning; confused with fire No. 3; crew reported under control July 18, 1920; 100 acres, mostly brush; threatened valuable Muir Grove.

Date and hour.	Person reporting and place from which reported.	Location given with bearings.	Cause and remarks.
6. July 19, 1920, 9.55 a. m.	Camper Oscar Dimick; at superintendent's office.	Marble Fork Road, near "Hard Rock Bend."	Insect control fire; under observation and control of rangers.
7. Aug. 3, 1920, 5 p. m.	Supt. Hough; Mount Whitney power house No. 1.	T. 16 S., R. 29 E., sec. 33.	Unknown cause; Ranger Hunter and assistance from power house had under control noon Aug. 4, 1920.
8. Sept. 2, 1920, 7 p. m.	Attorney Wm. Hazlett seen from Beetle Rock.	T. 15 S., R. 29 E., sec. 20, Pine Ridge.	Careless campers, not apprehended; Ranger Dorr, cattlemen, and crew under control Sept. 4, 1920.
9. Sept. 6, 1920, 8 p. m.	Power house No. 3; telephone.	T. 16 S., R. 30 E., sec. 18, under Moro Rock.	Superintendent, ranger, and clerk went to location; no fire; campers' fire probably mistaken for forest fire.
10. Sept. 12, 1920, 2.30 p. m.	Discovered by the superintendent while on Black Oak Trail.	T. 15 S., R. 29 E., sec. 19, crest of Pine Ridge.	Superintendent, office force, ranger, and crew set out immediately; fire under control 7 a. m., Sept. 13, 1920. Prompt action saved possible disastrous conflagration.

THE BIG TREES.

The preservation in their natural state of these monsters of the vegetable kingdom must ever be of prime interest. Further steps have therefore been taken to protect them against inquisitive and vandal hands. The Sherman Tree, oldest and largest of living things, was suffering from the auto travel which had worn deep ruts around its massive bole; ruts that abraded the tree's roots, while the oil and gasoline drippings from the cars could not but have a bad effect. The entrance for autos has been temporarily blocked by logs and a sign posted forbidding auto travel. Rustic posts will soon be put up in such manner as not to obstruct the view. Wild-flower seeds will be strewn this fall over the pulverized area around the tree, and it is hoped that its beauty will be enhanced and its life prolonged by such treatment.

For many years signs have been nailed to Sherman and other trees. These are being removed and placed on posts near by. An interesting collection of unauthorized signs, naming big trees, is being made and is exhibited on the outside wall of the superintendent's office, where it serves as an example of the futility of such action on the part of visitors.

Probably we must gradually give to the big trees and other natural features harmonious and suitable names; this in order to protect them against indiscriminate nomenclature and to direct visitors to them.

WILD FLOWERS.

The further protection of wild flowers for the benefit of all visitors must be considered. Several persons, chiefly women, were warned when found in possession of great armfuls of flowers, usually plucked from near-by meadows.

The exhibit of wild flowers maintained by Mrs. Magly, assisted by other ladies, in the entrance to the superintendent's office, was much admired and was of educational value both from botanical and administrative standpoints. If botanical interest is awakened, so is the desire to protect the flora.

A similar exhibit of the cones and branches of sequoias, firs, pines, and other trees, shrubs, and flowers was of equal value. These exhibits form the nucleus of the Park Museum, to be established when appropriation is available for the necessary building.

WILD ANIMALS.

All wild animals seem to be increasing. Deer and bear are seen daily at Giant Forest and graze or feed around camps. Many campers have pet chipmunks and squirrels. Mountain sheep were reported on Mount Silliman. Elk have been seen near the park, but it is not certain that any are now within it. A beaver family spent a few days on the creek that ripples through Giant Forest camp within 100 yards of this office.

Lions and lynx cats are increasing, and it will be necessary this winter to campaign against them. A female lion, feeding young, is said to kill 100 deer a year.

BIRDS.

The robin, crested jay, junco, towhee, chickadee, and humming bird—these are the feathered friends noted by all; but 162 species in all visit or remain in the park and jewel the air. In mid-August, at Farewell Gap, humming birds were observed flying over snow-banks from one flower bed to another. The golden eagle may often be seen soaring below Moro Rock. The Sequoia Park is an ornithologist's paradise.

FISH.

Fishing was excellent in almost every river, creek, and lake. Well into the season the skillful angler could take the limit of 20 on creeks within a mile or two of Giant Forest. Periodic stocking by the park service and State authorities has brought about this happy result.

During the season the following fry were liberated in park waters:

Date.	Number.	Kind.	Name of water stocked.
1920.			
July 18	25,000	Rainbow trout.....	Lower Middle Fork, Kaweah River.
23	25,000	Steelheads.....	Upper Middle Fork, Kaweah River.
Aug. 2	9,000	Rainbow trout.....	Marble Fork.
2	8,000	.....do.....	Wolverton Creek.
7	2,500	.....do.....	Log Meadow Creek.

THE CRYSTAL CAVE.

The Crystal Cave was officially closed during the season, but several parties of distinguished visitors, who were interested in its wonders as more than a "tourist show," were taken through a limited number of its passages and chambers under direct supervision of rangers.

It is hoped that, whether lighted or not, provision may be made to allow visitors partial access next season under strict supervision. But the provision of electric lights, whether by a system for the cave alone or by a joint system for the cave and Giant Forest, is an urgent need.

The Crystal Cave is pronounced by those who have seen America's finest caverns of a similar nature to be superior to all others in size of chambers and beauty of formations. With the big trees it therefore offers to visitors an attraction afforded perhaps by no other park.

The surroundings of the Crystal Cave, the twin waterfalls on Cactus Creek, the beautiful creek itself, some recently discovered Soda Springs within half a mile of the cave entrance, all in all comprise possibilities of unbounded development. The contrast of vegetation at the cave, 4,200 feet elevation, from that at Giant Forest, 6,500 feet, is an additional attraction, while the milder climate makes it an immediate all-the-year-round possibility.

COOPERATION WITH OTHER BUREAUS, ETC.

The visit of Mr. Paul Redington, district forester for whole of California, enabled the superintendent to come to an understanding with him on many subjects. An early visit is expected from Forest Supervisor Cunningham, of Hot Springs headquarters.

Cooperation with the United States Bureau of Entomology resulted in the treatment of various trees infected with the destructive pine beetle.

Cooperation with the State rodent control resulted in the destruction of thousands of ground squirrels on the lower park levels.

Cooperation with Tulare County board of supervisors resulted in improvement by the park service of the county section of the Giant Forest Road and the appropriation of \$15,000 by the county, which insures a good road for next season's travel.

Cooperation with the Tulare County Board of Trade and Visalia Board of Trade has resulted in preparation of a handsome park exhibit for the Tulare Livestock and Agricultural Fair at Tulare in September and one also for the Tulare County Fair at Visalia in October.

APPROPRIATIONS AND REVENUES.

APPROPRIATIONS.

The appropriations for these parks have not kept pace with their development, revenues, and patronage, nor with the depreciated value of the dollar. As early as 1900, when Sequoia Park was visited by but a few score of people annually, the appropriation was \$10,000, and this was gradually increased to \$15,000 in 1908, to \$22,000 in 1917, and to \$30,000 in 1919. We are now working on the 1921 appropriation of \$36,000.

When the matter of wear and tear on roads, owing to motor travel, and the provision of water and sanitary arrangements for thousands of campers is considered in comparison with the old days of wagon and buggy and scores of campers where thousands now arrive, the justice of a claim for larger appropriations will be evident.

The appropriations for General Grant Park have risen from \$2,000 in 1904 to \$5,000 in 1920.

REVENUES.

The revenues of the Sequoia have risen from \$43 in 1908 to \$13,000 in 1918. The estimated revenues for 1921 are \$25,000.

The revenues of General Grant Park have risen from \$63 in 1908 to \$1,800 in 1918.

The revenues of both parks will be vastly increased as soon as hotel operators provide better accommodations and the percentage of their profits is received by the Government.

RECOMMENDATIONS.

I have been in charge of these parks less than three months and have therefore not had full opportunity to study the situation and make recommendations. However, I concur with the recommendations of my predecessor that the proposed enlargement of the Sequoia be urged on Congress and that further steps be taken to secure the patented land remaining within the parks.

If, in addition to the above, the recommendations made in Estimates for Appropriations for 1922 are favorably considered, the Sequoia and General Grant Parks will fare well during the coming year.

CONCLUSION.

In conclusion, I feel it is an honor to be superintendent of these magnificent public domains. It would be difficult to conceive of a work which gives more opportunity for service.

The hearty support of the director, acting director, and others in the Washington office has been much appreciated by all in these parks. We are made to feel that official routine and red tape are the servants of the National Park Service rather than its masters. With this support and encouragement we turn our backs on a year of fruitful work and face the coming year with the determination to make it bear even better fruit.

MOUNT RAINIER NATIONAL PARK.

ROGER W. TOLL, Superintendent, Ashford, Wash.

GENERAL STATEMENT.

Mount Rainier National Park was created by act of Congress approved March 2, 1899, and exclusive jurisdiction of the territory so set aside was ceded to the United States by act of the Legislature of the State of Washington approved March 16, 1901. Exclusive jurisdiction of the reservation was accepted by act of Congress approved June 30, 1916.

The park is located in the western part of the State of Washington, immediately west of the summit of the Cascade Mountains and about 40 miles southeasterly from the southern end of Puget Sound. It is situated largely in Pierce County, but a portion lies in Lewis County. The main entrance of the park is located near the southwest corner, distant by automobile road 96 miles from Seattle, 56 miles from Tacoma, and 6½ miles from Ashford, on the Tacoma & Eastern Railroad, a branch of the Chicago, Milwaukee & St. Paul Railroad.

Longmire Springs, distant 6½ miles by automobile road from the main entrance, is the headquarters within the park of the park superintendent and the Rainier National Park Co. Longmire Springs is connected by telephone to Seattle, Tacoma, and the principal camps and ranger stations within the park.

Mount Rainier National Park is in charge of a superintendent, who is assisted throughout the year by a clerk-stenographer and four permanent park rangers. During the summer season of this year the local force was increased by eight temporary park rangers and a small construction and repair force.

ROADS.

The main thoroughfare of the park is the Nisqually Road, leading from the park entrance at the southwest corner of the park, to Paradise Valley, a distance of 20 miles.

This road was open as far as Longmire Springs during most of the winter, with the exception of a few days following storms, but it was blocked by snow from March 29 to April 26.

The first automobile reached Longmire Springs on April 26, the Nisqually Glacier on May 10, Narada Falls on June 12, and Paradise Valley on July 10.

The road work was begun on May 1 and continued throughout the season with a small crew.

Obsolete bridges and trestles at Dry Creek, Christine Falls, and at the first switch-back above Narada Falls were removed. The appearance of the road at several points was improved by the removal of unsuitable structures.

The ditches and culverts were opened, broken culverts repaired, additional planking added on several of the bridges, parapet walls repaired, and the usual maintenance work was done. Some new surfacing material was added at the most necessary points, but much remains to be done in the way of surfacing.

The parking space at Paradise Valley was improved by grading and surfacing.

RECOMMENDED ROAD WORK.

One of the principal needs of the Nisqually Road is extensive surfacing, preferably of crushed rock. During the past three years, on account of limited funds, the road crew, employed on maintenance work, has been kept to a very restricted number, and it has been impossible for these few men to accomplish much in the way of heavy surfacing. The heavy travel and heavy trucking that this road receives makes considerable surfacing an imperative need at the present time.

The State of Washington and Pierce County plan to complete the paving of the road from Tacoma to the park entrance, of which 20 miles are already paved. This work has been widely advocated and repeatedly urged, and it will probably be undertaken within a year or two. When this road is paved to the park entrance the volume of travel entering the park will far exceed all previous records, and it is desirable to make provision for this increased traffic and to provide roads inside the park that shall be at least equal in quality to the roads leading to the park. The number of automobiles passing over the road sometimes exceeds 1,000 per day.

The proposed operation of the National Park Inn at Longmire Springs throughout the winter renders the paving of the road to this point more imperative as the present road becomes badly cut and almost impassable under traffic during the winter.

The paving of the Nisqually Road from the park entrance to or beyond Longmire Springs has been recommended by the civil engineer of the service. The distance to Longmire Springs is 6.7 miles. If the paving of 2 or 3 miles is completed each year the cost can be distributed over several seasons.

Before the road is paved it is very desirable that the alignment should be improved by the rounding off of the sharper points. At present there is danger of accident, due to the fact that on these sharp curves the approaching traffic is not visible at a sufficient distance. Careless drivers imperil the safety of others. Collisions and minor accidents have occurred at these points and serious accidents have been narrowly averted.

The last 8 miles of road in the park, from Glacier Station to Paradise Valley, is a one-way road, and cars are only permitted to enter on this road at hourly intervals.

The operation of this road requires the employment of four traffic rangers. With the increasing volume of travel, the handling of traffic on this road becomes more and more difficult, and the delays to the thousands of passengers become more objectionable. This road should be widened so as to permit traffic in both directions, or else a second road should be constructed so that ascending traffic can take one route and descending traffic can take the second road. A combination of these two methods is recommended as follows: A second road can be constructed from Paradise Valley, in the direction of the public camp ground, and descending, join the present road between Oh My Point and the head of the Tramway Trail, or in the vicinity of milepost 15. From this point the road can be widened to permit two-way traffic to a saddle, near Lilly Lake, at milepost 14.2. From this point a second road, to be used by descending travel, can be built through the wooded area back of Ricksecker Point, and rejoin the present road a short distance above milepost 13. From this point the present road can be widened to Glacier Station, a distance of 1 mile. This latter portion of the work would involve the heaviest construction and a steam shovel could be used to advantage. The steep slope on the upper side of the road should be riprapped to prevent slides. The cost of this work would be about equivalent to the cost of constructing 8 miles of new one-way road. If 2 miles of this road are double tracked each year for four years the annual expenditure will be distributed over several seasons. The provision for two-way traffic on this road has been recommended by the civil engineer of the service.

There are a few places on the road between Longmire Springs and Paradise Valley that need improvement. There are two sharp switchback curves between Longmire Springs and Glacier Station, that are on heavy grades. The radius of these curves should be increased and the grade reduced. There are two similar curves on the road above Narada Falls, one between the first and second switchbacks, where the radius of the curve is so short that a long-base car can not take the curve without backing up. This is the sharpest curve at any point on the road. Another short radius curve on a steep grade is between the second and third crossings of Paradise River. The road just below Glacier Station is used by two-way traffic but is not sufficiently wide for this purpose. It should be widened by additional rock excavation.

The proper maintenance of the Nisqually Road requires the purchase and operation of a portable crusher. It is becoming more and more difficult to obtain material from the few deposits of volcanic sand and gravel. If the oversized material in these pits were crushed and used with the sand, which has considerable cementing value, this mixture would give excellent results. The equipment required is a crusher, gasoline engine, elevator and loading bias. The operation of the crusher will require four or five men in addition to the road maintenance crew.

A utility road to the new powder house, a distance of about a thousand feet, is needed. The road at Ricksecker Point should be made more safe by cutting it back to obtain a more secure footing on the steep hillside, and by straightening the alignment. This represents heavy work on a quarter of a mile of road, including considerable rock work. The high bank above the road should be sloped back and faced with riprap or masonry so that the danger of falling rocks will be eliminated.

The construction of additional parapet walls or guard logs along the Nisqually Road should be continued. This is necessary to prevent accident.

Additional culverts are needed in the Nisqually Road to prevent damage to the road each spring when the snow is melting rapidly and the run-off is high.

PARKING SPACE AT PARADISE VALLEY.

The present parking space for automobiles at Paradise Valley is wholly inadequate for the needs at this point. Cars are parked all over the hillside at dangerous angles. The space can not be well utilized and the exit of cars is often blocked by the parking of other cars. In wet weather the parking spaces become impassable and cars are mired in them. When the road is first opened in the early summer there are more that wish to go to Paradise Valley than can be accommodated in the parking space available, and some must therefore be excluded. With snow on the ground, and melting rapidly, all spaces that are not adequately surfaced quickly become muddy and cars using them are unable to extricate themselves.

Some work has been done this season in the central parking space, which is the most heavily used. Grading was done with teams and a depression in the area was filled to a depth of 3 feet. Some surfacing was done but additional grading and surfacing will be required to put this area in final shape.

The road leading to the camp grounds should be widened so as to allow the parking of a line of cars on the upper side of the road, and at right angles to it, and still permit a double line of traffic to and from the camp grounds.

The road from the traffic station to the ridge occupied by the old Paradise Camp should be widened, surfaced and improved, and additional parking space provided near the upper portion of this road.

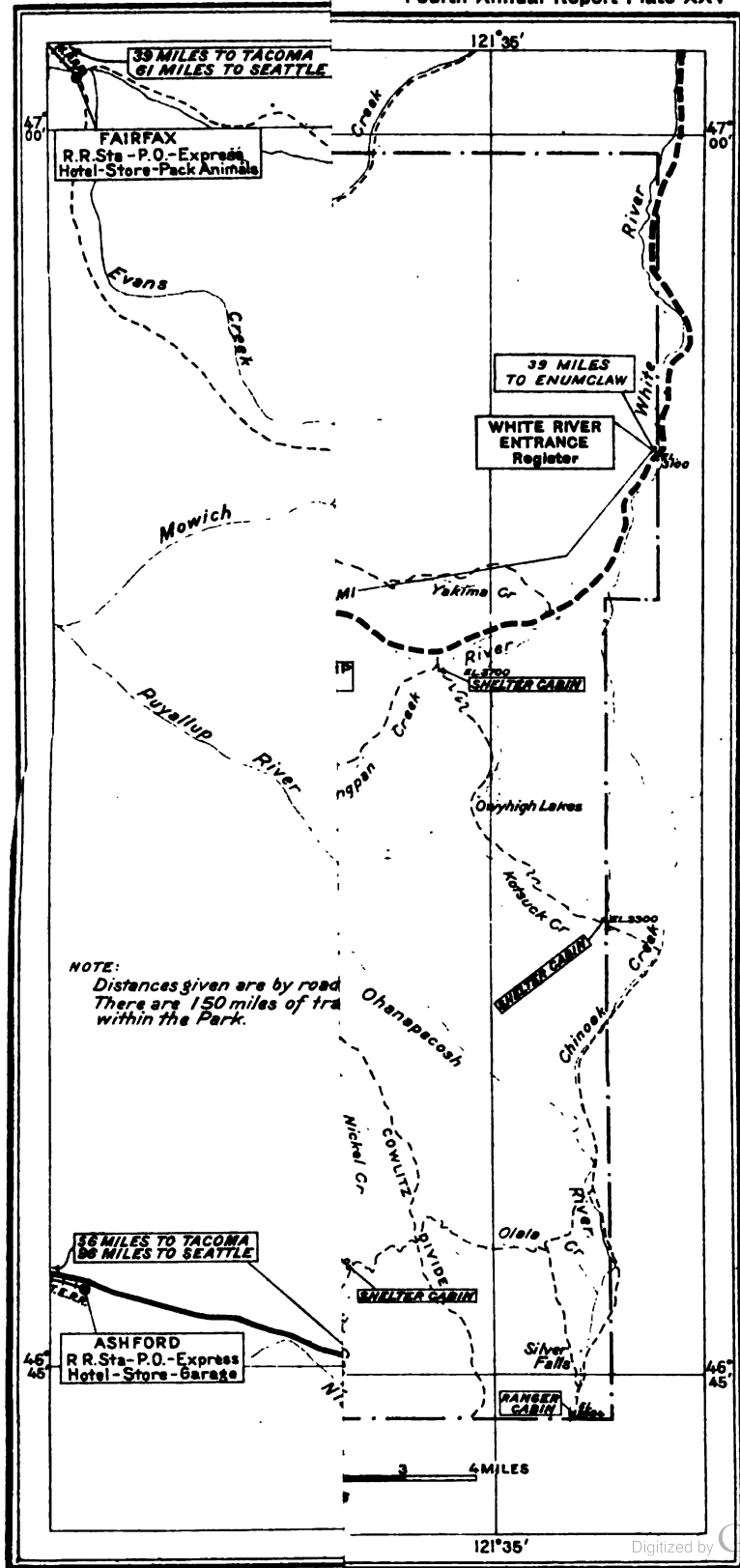
TRAILS.

There are 150 miles of trail in the park. A trail 95 miles in length encircles the mountain and other trails connect this trail with the four principal entrances to the park. Other trails lead to the main points of interest in the park and offer various excursions to visitors. Most of the trails are equally serviceable for foot or horse travel, but some trails are intended for pedestrians only.

At the beginning of the season the trails in the southern portion of the park were opened up by men from Longmire Springs. A party of four men and pack animals were sent out on June 15 to open the trail on the west side of the mountain preparatory to the starting of camping trips on the Wonderland Trail. The trails in the remote sections of the park were opened by the rangers in these districts.

The trail from Tahoma Creek to Indian Henrys Hunting Ground was rebuilt this year so as to obtain a grade suitable for horse travel. The distance was about 2 miles. A new location was selected for much of this trail so as to make it somewhat more attractive from a scenic standpoint.

The trail leading from the West Side Trail to Klapatche Park, a distance of 2½ miles, was begun last year and was completed this year, with the exception of a short distance at the upper end of the trail, which was under snow at the time the work was done.



Klapatche Park is now accessible to camping parties and is one of the most beautiful parks on the slopes of the mountain.

A short trail, about a quarter of a mile in length, was built on the south side of Stevens Creek, in order to eliminate two crossings of this stream, which had become difficult for both foot and horse travel.

Several new trails were constructed in the vicinity of Paradise Valley. One leads to Alta Vista and continues to a point on the rim of the Nisqually Glacier, known as Glacier Vista, and then returns to Paradise Valley by another route over Alta Vista. This circuit trail is a mile and a half in length and is the most popular of the short trips from Paradise Valley.

Another trail was partially constructed from Paradise Valley to Timberline Ridge and is used by parties going to the Paradise and Stevens Glaciers.

Another trail was partially constructed from Paradise Valley to the crossing of the Paradise River, below Sluiskin Falls. It is the intention to extend this trail next season to Timberline Ridge by way of Sluiskin Falls and also to Mazama Ridge, so as to offer a short cut for parties not wishing to take the entire Skyline Trail trip.

These trails, completed and under construction, will offer a wide variety of trips to visitors wishing to make short excursions on foot from Paradise Valley. These trips may be safely taken without guides and will fill a demand that is increasing yearly.

In order to make the trails of the greatest use to visitors it is very desirable that signs be placed at the beginning of each trail and at all trail junctions, giving the names of the points of interest, their direction, distance, and elevation. Some signs of this character have been placed this year and more work of this sort should be done each season.

A plan has been inaugurated this year of placing trail markers at every tenth of a mile along trails. These markers are of galvanized iron, with welded metal letters, and enameled in two colors. They state the distance in miles from the beginning of the trail. It is found that an interval of a tenth of a mile is not too frequent for such markers on trails. This work should be continued each season until completed.

The measurement of trails has been found to be quickly and easily accomplished by the use of a bicycle wheel fitted with an ordinary cyclometer. By putting 10 lugs on the wheel in place of the usual one lug the cyclometer reads to hundredths of a mile and is accurate within 1 or 2 per cent, which is all that is desired in trail measurement. The measurements can be made by one man at an ordinary walking rate.

RECOMMENDED TRAIL CONSTRUCTION.

From a communication standpoint the trail around the mountain is of prime importance. The stretch of trail from Spray Park to the east side of the Winthrop Glacier, a distance of 14 miles, is in more need of reconstruction than any other section of the trail. The trail should be reconstructed, eliminating excessive grades, widened, and improved. New bridges are needed at the crossings of the Carbon River and Winthrop Creek. At present it is necessary to cross the lower part of the Winthrop Glacier, and a new trail should be constructed just below the glacier, as it is impossible to maintain a permanent trail across the ice, and this crossing is usually difficult.

The trail between Summerland and Indian Henrys should be improved, particularly by rock work at the side of the Fryngpan Glacier. This trail lies above timber line for several miles and should be marked by additional stone monuments and trail markers.

A change in the river channel at South Mowish River this year necessitates a new bridge at that point.

The trail from Longmire Springs to Indian Henrys Hunting Ground is in good condition as far as Devils Dream Creek, but beyond that point a stretch of new trail should be constructed in order to eliminate excessive grade and to offer good footing.

Other short sections of trail need relocation or improvement by draining, bridging, or widening.

The trail construction in the vicinity of Paradise Valley should be completed and extended. The trails should be widened to a width of 4 or 5 feet, and as soon as adequate trails are provided the various paths across the hillsides should be blocked off and travel confined to the trails.

The trail from Paradise Valley to Anvil Rock and Camp Muir should be improved and marked with monuments of stone and trail markers, so as to make it safe for the increasing number of visitors who wish to make these trips on foot from Paradise Valley. The trail should be made more serviceable for pack horses to Anvil Rock and Camp Muir.

The trails radiating from Paradise Valley are traveled by more people than any other in the park and should be improved and extended so as to form a comprehensive system of trails.

BUILDINGS.

The roof of the cabin at Mowish Lake was crushed by snow. A new and stronger roof was built this season.

Some improvements were made in the ranger's cottage at the park entrance, consisting of interior partitions and finishing work.

RECOMMENDED BUILDING CONSTRUCTION.

The present traffic station at Paradise Valley is in an unsightly location and the building is inferior, too, and not in harmony with the other buildings in Paradise Valley. A new location for the building has been selected by the landscape architect, on the opposite side of the road, and the construction of a new building recommended by him. It is advisable that the building to be constructed be of adequate size, to include not only an office, kitchen, and sleeping quarters for the rangers but also a comfort station, containing toilet and washing facilities for the public, and that the office be arranged to serve as information center, with exhibits of maps, pamphlets, photographs, flowers, and other material that will furnish desired information and increase the educational value of the park.

At the park entrance living quarters for the clerk and other employees are desirable. At the present time quarters are available only for the superintendent, chief ranger, and two men. The latter quarters consist of a room over the office. There have been times when the application of a competent clerk for a permanent position could not

be accepted for the reason that winter quarters are not available for a married man. The construction of a cottage for this purpose has been proposed in previous years, and the building site has been partially cleared.

The garage at the park entrance is inadequate in size for winter use. Its location is unsatisfactory, and a relocation has been recommended by the landscape architect of the service. The new building should include a tool room and workshop.

At Longmire Springs the garage is inadequate to hold the truck equipment of the park. There is no workshop where repairs can be conveniently or economically handled. It is recommended that a garage be constructed with sufficient capacity to quarter the park equipment, namely, one touring car and three trucks, and that some additional capacity be provided for additional present and future needs. Also that a tool room and workshop be provided in connection with the garage.

A blacksmith shop is needed at Longmire Springs.

The landscape engineer of the service has commented on the need for utility buildings at Longmire Springs, and has prepared a plan for the location of such buildings extending beyond present needs, so that present and future development will be along predetermined lines.

Camp quarters for the road crew are needed at Narada Falls. At present it is necessary to move up tents and camp equipment each year from Longmire Springs and to erect the tents on snow-covered ground. The cost of making camp in the early summer, removing it in the fall, and replacing tents and other articles of equipment as they become unserviceable warrant the construction of buildings for this purpose. Improved accommodations for the road men would be beneficial to their health and promote better work. The buildings required would be two bunk houses, for 12 men each, and a cook house with eating room.

Additional shelter cabins are needed on the trail around the mountain, so that overnight shelter can be obtained either by visitors or rangers while on summer work or winter patrol. These cabins should be located at suitable places about 10 or 15 miles apart. A few of these cabins should be built each year until an adequate number are constructed.

A fire-lookout station should be constructed on the summit of Mount Rainier. The Forest Service has advocated such a station and would cooperate in its construction and furnish two observers or lookouts. The lookout station at Anvil Rock, at an elevation of 9,584 feet, is the most important observation point in the Rainier National Forest, and many fires have been located from this point. The park service shares in the benefit and protection afforded by this station, as well as the Forest Service and the general public. A lookout station on the summit, at an elevation exceeding 14,000 feet, would be of still greater service in the location of forest fires than the one at Anvil Rock. As a protection to parties making the summit climb, a shelter building at the top of the mountain would be of great value and might easily result in the saving of life in case of accident or physical exhaustion. The weather observations that would be obtained at this station could be of material value to the United States Weather Bureau. The Forest Service has indicated their willingness to contribute toward the cost of this building. The Anvil Rock station was built entirely at the expense of the park service.

The present shelter cabin at Camp Muir, at an elevation of 10,000 feet, is insufficient in size and inadequate in its accommodations to serve the needs of visitors making the summit climb. At present visitors sleep on mattresses on the floor of the cabin. Not more than 12 persons can be comfortably accommodated. Frequently 20 or more require shelter, and the number of visitors taking the trip, which is one of the finest mountain climbs in the country, would be increased if proper accommodations were available. A shelter cabin should be constructed with bunks, in tiers, sufficient to accommodate 30 persons, and with separate quarters for men and women.

The clerk, telephone operators, lineman, and mechanic are at present quartered in tents at Longmire Springs. Frame buildings would be desirable.

A building to be used as post office and telephone exchange is needed at Longmire Springs.

SANITATION.

A sewer 533 feet in length was constructed at Paradise Valley to serve the public toilet at that place and also the new Paradise Camp building and the club building, constructed by the Rainier National Park Co. The sewer connects with the sewer constructed last year to the Paradise River.

RECOMMENDED SANITARY IMPROVEMENTS.

The public toilet facilities in the park are inadequate for the increased number of visitors, and present conditions are far from satisfactory or sanitary. A considerable increase in the facilities is urgently required. At Paradise Valley Camp ground there is but one small toilet building. The number of campers at this location frequently exceeds 500 persons. The toilets are of a flushing type, but have no sewer outlet. They discharge into a cesspool which is overloaded and the result is insanitary. It is recommended that an additional building be constructed with increased facilities and containing also wash-basins and shower baths for the use of visitors to the public camp grounds. This building can be located above the camp ground, so that it can be connected with the sewer to Paradise River. In case it is found preferable to locate the building in the camp ground a new sewer to Paradise River will be required.

The toilet facilities at Narada traffic station should be doubled by the construction of an additional building.

The toilet facilities at Longmire Springs are altogether inadequate and should be supplemented by two new buildings.

The toilet facilities at park entrance should be doubled by additions to the two present buildings.

Two small toilets should be constructed at Van Trump Camp grounds, improvements made in the present water main, and a sewer constructed.

The toilet at Glacier traffic station is so located as to be objectionably prominent. New toilets should be constructed and located either under the bridge or in a more suitable position lower down on the road.

Improved sanitation in the park is one of the most urgent needs at the present time.

PUBLIC CAMP GROUNDS.

For the accommodation of visitors who bring their own tents, beds, cooking utensils, and food supplies free public camping grounds are provided at Longmire Springs, Van Trump Camp, and Paradise Valley. These grounds have been cleared and are supplied with water and toilet facilities. The use of these public camp grounds is increasing rapidly each year.

There is a need of improvement in these camp grounds by the addition of shelter buildings and stone fireplaces with grills for open-air cooking. The construction of such fireplaces will reduce the constant hazard of forest fires from unextinguished camp fires, and will improve the camp grounds by confining the building of fires to designated localities. If suitable designs have been adopted in the other parks, such designs would be followed. If there is no adopted standard, it would be desirable that the matter be referred to the landscape architect for the preparation of standard designs for these structures.

The camp grounds at Paradise Valley are badly in need of improvement and enlargement. New roads should be graded and surfaced, thus enlarging the area that can be reached by camping parties. About one-half mile of new road is required.

At Hanson's Camp one shelter building and two fireplaces are needed. At Longmire Springs Camp grounds two shelter houses and eight fireplaces are needed. At Van Trump Camp one shelter building and four fireplaces are needed.

The camp grounds in the park are inadequate in size and number and the result is that parties camp along the road at unsuitable locations, where water is not available. The danger of forest fires is greatly increased by this condition. There is a desirable camp ground on the west side of the automobile road, at milepost 9, or about 2.3 miles above Longmire Springs. A small stream of pure water is available, wood is abundant, the ground is level and can be cleared for a camp ground. The camp can be kept screened from the road, which is a desirable feature.

TELEPHONE SYSTEM.

Before the beginning of the season the telephone system of the park was improved by changing the grounded circuit from Longmire Springs to Paradise Inn to a metallic circuit and also by constructing a second metallic circuit from the park entrance to National. This gave a direct circuit from Longmire Springs to National without any intermediate telephones. The Pacific Telephone & Telegraph Co., at the request of the park service, constructed a second circuit from National to Tacoma. The cost of this circuit was \$15,000 and was borne by the Pacific Telephone & Telegraph Co. This circuit was connected with one of the two park service lines to National, so as to give a direct line from Longmire Springs to Tacoma, without the necessity of obtaining a connection through any intermediate exchange. This direct service has been of great value in obtaining prompt service on long-distance calls and the improvement in the park lines has made long-distance conversation much more satisfactory.

The number of long-distance calls handled monthly run from 500 to 1,000, and the local calls handled through the switchboard at Longmire Springs are from 3,500 to 4,000 per month.

There are 23 telephones in the park with direct connection to the 10-line switchboard at Longmire Springs. In addition to these lines, there is a local circuit between the park entrance and National with 11 telephones. Additional ranger lines run to the Carbon River ranger station, Ohanapecosh ranger station, and the White River ranger station. These lines have 12 telephones, making a total number of 46 telephones on the system. The telephone lines have a total mileage of about 120 miles.

The switchboard at Longmire Springs is operated a period of 16 hours per day—from 6 a. m. to 10 p. m. The two operators divide this period into two shifts of eight hours each and handle considerable office and clerical work in addition to their telephone duties.

MISCELLANEOUS EQUIPMENT AND IMPROVEMENTS.

The pleasure of a drive over the park road is considerably interfered with by clouds of dust during the summer. Visitors have complained of this condition, and the sprinkling of the road seems advisable. The work could probably be handled by four sprinkling trucks, each operating over a stretch of road from 4 to 6 miles in length. One such truck could be purchased each year and provision made for its water supply.

The purchase of a Ford truck would be a desirable addition to the motor equipment of the park. Its use would facilitate the transportation of men to and from work and would save the uneconomical use of a heavier truck for delivering light loads of supplies. Its operation would not require an expert truck driver and the cost of supplies and maintenance would be less than for a larger truck. Its use would be particularly advantageous during the winter months.

The purchase of two motor cycles is desirable, one to be used for the patrol of camp grounds and the other for use of the lineman in patrolling and repairing telephone lines.

A scenic finder has been designed and constructed for Alta Vista, near Paradise Valley. Other scenic finders should be placed at the principal viewpoints in the park that are frequented by large numbers of visitors. These serve to furnish desired information to visitors as to geographical location of points in the park and stimulate a wider and more general interest in the park.

Mountain registers should be placed on the principal peaks in the park so as to secure information as to the number of visitors taking the various trips and also to decrease the habit of leaving names on paper, cards, and other unsuitable methods. The registers are of general interest and stimulate trips in the park.

There are 5 or 10 square miles of burned areas in the southern portion of the park that were burned a number of years ago. On a part of this area natural reforestation is proceeding slowly, but on other parts no new growth is coming up. Reforestation of these areas should be begun by planting. The cost of this work is from \$10 to \$14 per acre or about \$8,000 per square mile.

MEDICAL PROTECTION.

During the month of May medical protection was furnished to employees of the park service by a contract with Dr. T. H. Long, of Ashford, and Dr. A. W. Bridge, of Eatonville. During the remainder of the summer medical protection was furnished by agreement with the Rainier National Park Co. A resident park physician was employed and a hospital was maintained at Longmire Springs with a trained nurse in attendance. A payroll deduction for medical protection was made from employees on maintenance and construction work and from such other employees as elected to secure this protection. Under the agreement with the Rainier National Park Co. this deduction was at the rate of 10 cents per day, but not exceeding \$1 in any calendar month, per man.

ACCIDENTS.

No fatal accidents or deaths occurred in the park during the season.

Several accidents to park service employees occurred and were reported to the United States Employees' Compensation Commission, but no permanent injuries resulted.

Several visitors met with accidents. One woman received a broken leg when the horse on which she was riding fell. Another woman received a broken arm while sliding on a snow bank. Other minor injuries were received, but no permanent injuries resulted.

VIOLATION OF LAW.

There were no serious violations of law that required the imposing of fines or sentences by the park commissioner.

One visitor was arrested for intoxication and the use of firearms. His two revolvers were confiscated, and he was expelled from the park. Two visitors were excluded from the park for the remainder of the season for careless driving and speeding. Numerous reprimands were given for violation of traffic rules, the picking of flowers, and similar offenses.

FOREST FIRES.

No serious forest fires occurred in the park during the season.

Two or three small fires were started by lightning in remote sections of the park, but went out without causing damage. Several fires were started by visitors who left unextinguished camp fires, but these were extinguished by prompt action and no damage resulted. One fire was started in the valley of Paradise River by workmen building a power line for the Rainier National Park Co. and required the work of a crew of men to extinguish it, but the area burned was not more than 30 feet in diameter.

Several fires occurred outside of the park but near the boundary line. One of these started at a logging camp on the Carbon River, about a mile from the park, on August 14. It was temporarily controlled, but on August 20 a high wind caused it to jump the fire line, and it was soon beyond control and sweeping toward the park. Serious results seemed probable, but a large crew of men was put to work by the logging company, supplemented by men employed by the Forest Service and by the park service, and the fire was checked at a distance of 400 feet from the park line.

Another fire was reported as being in the southeast portion of the park, but was finally located on Cougar Creek within less than a mile of the east boundary line of the park. Several park service men assisted in the control of this fire, and it was surrounded by a fire line after having burned 50 or 60 acres. This fire was caused by lightning.

PARK EMPLOYEES.

The ranger service during the summer consisted of a chief ranger, on duty at park entrance; one ranger at Longmire Springs; one ranger in charge of trail work; five temporary rangers on traffic work located as follows: Two at Paradise Valley, one at Narada Falls, one at Glacier Station, and one at park entrance; three temporary rangers at the outlying stations, namely, at Carbon River, White River, and Ohanapecosh River. The administrative force consisted of one clerk and two clerk-telephone operators at Longmire Springs.

The road work was done by a foreman and a small crew of from 6 to 10 men.

Trail construction was done by a crew of from 2 to 10 men.

Other employees included a warehouse clerk, lineman, truck driver and mechanic, carpenter, cook, etc.

The wage scale during the summer was \$5 per day for road labor, \$5.25 for trail work, and corresponding rates for the more skilled labor. These rates approximated the wage scale in this vicinity, although in many cases employees could have obtained higher wages in other employment.

The maximum number of employees at any one time was 40.

During the winter the force was reduced to the chief ranger, one ranger, and the clerk.

It would be very desirable if permanent employment could be offered to a few of the men whose places it is most difficult to fill with competent men on temporary employment. This applies to such positions as road foreman, lineman, and mechanic. Considerable useful work could be accomplished by such men during the winter months, and the uncertainty would be eliminated as to whether competent men could be secured for these positions when the season opens. A permanent skeleton organization creates continuity of responsibility and increases interest and ability in the work.

Several of the temporary positions were filled by students from the University of Washington, as the park season corresponds very closely with the period of the summer vacation.

A spirit of willing cooperation and loyalty to the park service existed that went far toward producing satisfactory results for the season's work, and credit is due to the individual employees for the manner in which they worked for the good of the service and the accommodation of the public.

FISH AND WILD ANIMALS.

Through the cooperation of the Pierce County fish and game commission 10,000 eastern brook trout fingerlings were obtained. Half of these fish were placed in Reflection Lake and the other half in the inlet to Louise Lake. The fish were 2½ or 3 inches long and were in good condition when placed in the water. These lakes are the ones most frequently visited in the park. They are at the head waters of the Nisqually and the Cowlitz Rivers, and if the fish do well, the result will be that not only the lakes but the streams below will be stocked with trout. Three hundred additional fish were placed in the small stream at Longmire Springs.

The continued stocking of lakes and streams is recommended in order to make fishing one of the attractions of the park. The glacial streams, however, do not offer much encouragement to the fisherman during the summer months, as the water is turbid with glacial grist during the warm weather and the fish do not bite well at such times.

A number of deer, black bear, mountain goats and game birds, such as grouse and ptarmigan have been seen during the season, but they are not present in sufficient numbers to be frequently seen nor to offer much of an opportunity for visitors to enjoy them.

The month of October is the open season for deer hunting in the State of Washington. During October, 1919, early snows drove the deer to the lower elevations of the park and in many cases across the park lines, which resulted in more deer being killed in the vicinity of the park than for several seasons past.

It was proposed that Pierce County and Lewis County establish game sanctuaries adjoining the park, in order to include the winter grazing ground of the deer, but this plan met so much local opposition that no action could be secured.

The reduction of the predatory animals in the park is very desirable in order that the game and wild life may be permitted to increase. This work can best be done by cooperation with the United States Biological Survey in the placing of paid hunters in the park. These men should be adequately paid and devote their time exclusively to predatory animals, without the necessity of trapping fur-bearing animals to supplement a nominal salary. The animals classed as predatory, and whose presence in the park is detrimental to game and other animals, are cougar, bobcat, lynx, coyote, and wolf. The cougar and bobcat are probably the most detrimental in this park. It is estimated that one cougar will kill a deer a week, or 50 per year, and the United States Biological Survey considers this estimate a conservative one. In addition to killing predatory animals, the game in the park should be protected by doubling the patrol force during the open season on deer, which is the month of October. The scant patrol force of three rangers should be increased by an additional three men.

A winter patrol should be established, consisting of not less than two men, who would patrol the park and its boundaries, during the winter, from November 1 to April 30, to prevent hunting and trapping. They can also assist in the killing of predatory animals.

To protect the park from hunters and to make the patrol work more effective, the park boundary line should be marked by conspicuous signs, spaced at short intervals, so that it will be less possible for hunters to cross the boundary of the park unintentionally. The boundary line is 72 miles in length. If this work were carried on each year, beginning in the most exposed regions, the result would be effective.

A party under the direction of Dr. Walter P. Taylor, of the United States Biological Survey, and including several prominent naturalists, spent the summer of 1919 in the park on field work for a publication on the birds and mammals of Mount Rainier National Park. The publication of this material is nearing completion, and it is interesting to note that the tentative list of mammals and birds occurring in the park comprises 54 animals and 102 birds. Two new forms of mammals were found in the park and have been designated as the Rainier meadow mouse and the Rainier pocket gopher. The white-tailed ptarmigan occurring on Mount Rainier is also classed as a new subspecies.

Through the cooperation of Theo H. Scheffer, of the United States Biological Survey, four beaver were obtained for the park. One was a young beaver and three were matured animals. The beaver near Walla Walla have been causing damage in the cultivated areas and their removal has been requested by the farmers. The four beavers were captured there and shipped to the park. They were liberated half a mile from Longmire Springs to find a suitable location for their new home. There are already one or two small beaver colonies in streams tributary to Tahoma Creek.

FIREARMS.

In a few cases permits have been issued to persons taking extended camping trips in remote sections of the park, to carry revolvers for protection, but in most cases firearms have been collected at the park entrance and held until the return of the party.

GRASING.

A permit was issued to H. J. Snively, jr., for the grasing of 500 head of cattle in the White River section of the park. This permit was originally issued in 1918 as a measure to increase food production under war conditions. The permit was renewed during the two following years upon the understanding that it will be discontinued at such time as the park service feels that this grasing is in any way detrimental to the primary use of the park by the public.

MINING CLAIMS.

Mining operations are confined to claims located prior to the act of Congress of May 27, 1908, prohibiting the location of mineral claims within the national park.

The Mount Rainier Mining Co. has a group of nine claims on the north side of the park, in Glacier Basin. These claims are now being patented. The company has done a small amount of assessment work this year, but has not shipped any ore. Their

permit for the use of certain lands adjacent to their property has been renewed by the service.

Two unpatented claims are owned by the Eagle Peak Copper Mining Co., about 2 miles from Longmire Springs. One car of ore was shipped during the winter, but the small profit shown can not be a very encouraging result for a year's work. Their permit for the diversion of water from the Paradise River for power purposes has been renewed by the service.

Sherman and Ike Evans have two unpatented claims adjacent to those of the Eagle Peak Co., but they have not been in active operation during the past year.

TRAVEL.

The travel during the winter months was less than usual as the approach road to the park was closed in October and not reopened until May 14. This road was closed to enable heavy grading work in the canyon of the Nisqually River, between La Grande and Alder. The road at this point was widened and grades improved on the stretch 2 or 3 miles in length. This work was done under the direction of the State highway commission. This road was opened for travel on May 14, but was not in good condition until July, so that the travel during the early months of the summer was less than it would otherwise have been.

The dates of opening the Nisqually Road to the principal points for the past six seasons are shown in the following table:

To	1915	1916	1917	1918	1919	1920
Longmire Springs.....	All winter.	May 18	June 4	May 1	Apr. 23	Apr. 28
Nisqually Glacier.....	May 15	June 15	June 28	May 12	May 27	May 16
Narada Falls.....	June 10	July 14	July 12	June 9	June 18	June 12
Paradise Valley.....	June 15	Aug. 24	Aug. 9	July 6	July 18	July 16

The depth of snow at Paradise Valley, which governs the date at which the road may be opened, was as follows during the past season:

	Ft. in.		Ft. in.
Mar. 1.....	8 2	June 15.....	8 4
Apr. 1.....	11 8	July 1.....	4 6
Apr. 20 (max.).....	16 0	July 15.....	0 5
May 1.....	12 6	Aug. 1.....	None.
June 1.....	10 7		

The travel during the early part of the season and up to July 1, showed a decrease as compared with last year, on account of the condition of the approach road, where construction work was uncompleted. Travel during the summer was restricted by the gasoline shortage which prevailed on the Pacific coast. This made it difficult to obtain gasoline for pleasure purposes and the use of private automobiles was considerably curtailed on this account.

In spite of these handicaps the number of visitors to the park exceeded all previous records. The weather during the season was favorable as there were weeks of sunny days without rain.

The increase in the motor vehicles of the United States has averaged 35 per cent per year during the last five years. The motor vehicles of the State of Washington have increased at the average rate of 38 per cent per year during the same period. It is reasonable to assume that the travel to the national parks will increase at about the same rate as the use of automobiles. Further increase of travel is to be expected from the improvement of roads, the development of additional areas in the parks, and a wider knowledge of attractions and opportunities offered by the parks.

The number of visitors to the park for the past six seasons is shown in the following table:

Period.	1915	1916	1917	1918	1919	1920
Jan. 1 to June 30.....	4,751	811	1,177	4,775	3,694	3,218
Month of July.....	11,306	4,786	8,132	12,386	14,139	17,476
Month of August.....	13,782	10,574	17,864	18,286	31,301	26,669
Sept. 1 to close of season.....	5,327	7,818	8,385	8,454	5,632	9,104
Totals.....	35,166	23,989	35,568	43,901	55,186	56,401

The figures for the year 1920 are for the 12 months ending September 30, 1920. The other figures are for the calendar years.

The total registration of visitors for the 12 months ending September 30, was as follows:

At main (Nisqually) entrance.....	55,632
At White River entrance.....	166
At Carbon River entrance.....	524
At Ohanapecosh entrance.....	169
Total.....	56,491

Distribution of visitors:

From Tacoma	12,337
From Seattle	16,891
From other points in the State of Washington	13,306
From points outside State of Washington	13,957
Total	56,491
Entering in private automobiles	46,833
Entering by Ashford stage	1,660
Entering by Tacoma and Seattle stage	6,788
Entering by motorcycle	165
Entering by horse-drawn vehicle	21
Entering on horseback	105
Entering on foot	919
Total	56,491

The number of private automobiles entering the park during this period was 10,814.
The travel during the Labor Day period was as follows:

	Cars.	Visitors.
Saturday, Sept. 4	364	1,556
Sunday, Sept. 5	710	3,171
Monday, Sept. 6	81	371
Total	1,155	5,097

The weather on Saturday was good in the park, but foggy in Tacoma and Seattle, which discouraged many from taking the trip. Sunday was foggy and cold all day, and many returned home, instead of remaining over Labor Day. On Monday the weather cleared.

The private automobiles that entered the park during the months of June, July, and August came from the following States:

	Cars.		Cars.
Arkansas	1	New York	13
Arizona	9	North Carolina	1
California	188	North Dakota	2
Colorado	9	Ohio	10
Florida	2	Oklahoma	5
Idaho	28	Oregon	305
Illinois	13	Pennsylvania	4
Indiana	6	Rhode Island	1
Iowa	13	South Carolina	2
Kansas	9	South Dakota	3
Kentucky	1	Texas	10
Maryland	2	Utah	2
Michigan	8	Virginia	3
Minnesota	10	Washington	7,383
Missouri	12	West Virginia	1
Montana	14	Wisconsin	11
Nebraska	9	Wyoming	7
Nevada	2	Canada	40
New Jersey	3		
New Mexico	1	Total	8,143

Thirty-seven States are represented in this list. Cars reentering the park are not included in the above figures.

SPECIAL EVENTS AND PARTIES OF VISITORS.

A party of 125 Mountaineers, the mountain club of Washington, visited the park on their annual winter outing from December 28 to January 1. The party made the trip on foot from Ashford, spending one night at Longpire Springs and the remainder of the time at Paradise Valley. Snowshoeing, skiing, tobogganing, and other winter sports were enjoyed.

The annual tournament of the Northwest Ski Club was held at Paradise Valley on Sunday, June 27. There were 13 contestants. The longest standing jump was 95 feet. An audience of more than a thousand persons attended the tournament.

The annual convention of the Shriners was held in Portland, Oreg., on June 21-24, and many of the delegates visited the park either before or after the convention.

A party of 57 from the national meeting of the State bank examiners visited the park from Seattle July 7 and 8.

The Secretary of the Interior, John Barton Payne, visited the park on July 8 and 9 with a party of 10 or 12 men from Seattle and Tacoma.

Director Stephen T. Mather accompanied the members of the House Committee on Appropriations upon their visit to the park on July 12. The party included James W. Good, chairman, and six other members of the committee, together with other prominent visitors and an entertainment committee from Seattle and Tacoma. The party left the park on July 13, and were entertained at luncheon in Tacoma and at dinner in Seattle.

Mr. A. E. Denaray, editor of the National Park Service, was in the park from July 15 to 18, and visited many points of interest.

Gov. Ben W. Olcott, of Oregon, visited the park on July 17 and 18.

A party of 34 members of the Massachusetts Forestry Association visited the park from July 20 to 22.

Mr. George Horace Lorimer, editor of the Saturday Evening Post, visited the park on July 21 and 22.

Mr. A. L. Westgard, representing the American Automobile Association, visited the park on July 22 on the pathfinding trip for the National Park-to-Park Highway route. Congressman Frederick C. Hicks, with his wife and daughter, visited the park on July 23 and 24.

A party of five members of the House Committee on Immigration and Naturalization visited the park on July 27 and 28.

The first aeroplane flights over the park and around the mountain were made in July of this year. Two planes circled the mountain and a third made the circle and passed over the summit of the mountain. Photographs and motion pictures were taken by the latter party. No landings have as yet been made in the park.

Mr. F. E. Matthes, of the United States Geological Survey, conducting a party of five boy scouts from New York City, was in the park from August 8 to 12.

Director Mather visited the park with a party of four, including his daughter, from August 9 to 11.

Theodore W. Noyes, editor of the Washington Star, visited the park from August 28 to 29.

The park had many other prominent visitors during the season, and was the source of pleasure, enjoyment, and benefit to thousands of persons from all classes of life and from all parts of the country.

MOUNT RAINIER.

In 1857 Lieut. A. V. Kautz made the first attempt to climb the mountain. The route he selected lay on the east side of the glacier now known by his name. After overcoming most of the difficulties of the ascent he was forced to turn back because of the lateness of the day without having reached the summit. On June 27 of this year a party of four, including the superintendent, followed the route taken by Lieut. Kautz, and after climbing 10,800 feet reached the summit of the mountain. They spent the night in a steam cave of the Summit Crater. This was the first ascent of the year.

Another ascent of the mountain by a new route was made on July 2 by a party of five from Paradise Valley. They climbed the cleaver between the Wilson and Nisqually Glaciers and successfully reached the summit.

The mountain has now been climbed by six, or possibly seven different routes, only two of which are used to any extent. It has been hoped that a route from Paradise Valley would be found that would be safer than the Gibraltar route, but it is still undiscovered.

The number of people that reached the summit this year was between 350 and 400. Mount Rainier now ranks as the third highest mountain in the United States (exclusive of Alaska). Elevations determined by the United States Coast and Geodetic Survey, and recently accepted by the United States Geological Survey, give Mount Elbert, Colo., the second place, with an elevation of 14,420 feet; Mount Whitney, Calif., has first place, with an elevation of 14,501 feet.

RECESSION OF NISQUALLY GLACIER.

In 1857, when Lieut. A. V. Kautz made the first attempt to climb the mountain, he camped near the foot of the Nisqually Glacier and stated that the glacier terminated at a narrow throat in the canyon. This throat is about 760 feet below the present bridge across the Nisqually River.

Mr. F. E. Matthes states that in 1885 the glacier reached down to the place now occupied by the bridge.

In 1892 the glacier was about 140 feet above the present location of the bridge. Since October, 1918, measurements have been made to the ice from a large rock on the west side of the river. This rock is 1,420 feet above the upper edge of the bridge. These measurements are as follows: October 19, 1918, 30 feet from rock to nearest ice; September 27, 1919, 89 feet from rock to nearest ice; June 16, 1920, 114 feet from rock to main front of glacier; September 10, 1920, 135 feet from rock to nearest ice. These measurements indicate a recession as follows:

	Recession.	Average per year.
	Feet.	Feet.
1857 to 1885.....	760	27
1885 to 1892.....	140	20
1892 to 1918.....	1,310	56
1918 to 1919.....	50	50
1919 to 1920.....	46	46

During the 63 years, from 1857 to 1920, the total recession has been 2,315 feet, or an average of 37 feet per year. During the past 28 years the average rate of recession has been 50 feet per year.

TRANSPORTATION SERVICE.

The Rainier National Park Co. operated throughout the season, on a regular daily schedule, touring-car service from Seattle and Tacoma to the park. Auto-bus service was operated from Ashford to the park and from point to point within the park.

A saddle and pack horse service was offered this year, by the Rainier National Park Co., between Longmire Springs and Fairfax, over the trail on the west side of the mountain known as the Wonderland Trail. The trip took seven days, and was offered

each week beginning July 10, but was discontinued on August 14 for lack of patronage. Those who took the trip were thoroughly delighted with the park and this manner of seeing it, and it is regrettable that the demand was not sufficient to enable the service to be continued.

HOTEL AND CAMP ACCOMMODATIONS.

The Rainier National Park Co. operated the National Park Inn and Annex, at Longmire Springs, and Paradise Inn and Paradise Camp, at Paradise Valley.

The National Park Inn was operated from June 15 to the close of the season and Paradise Inn and Camp were operated from June 26 to the close of the season.

The combined capacity of these hotels and camps is from 1,000 to 1,200 people, and all available accommodations were frequently utilized during the season.

RAINIER NATIONAL PARK CO.

The Rainier National Park Co. is constructing a power plant on the Paradise River, which will be completed this year and will permit the discontinuance of the two present power plants, one located at Longmire Springs and the other at Christine Falls. The capacity of the new plant will be 750 horsepower. Water is obtained from the Paradise River by a diversion dam, is carried by a wood-stave pipe line about 4,000 feet in length, and delivered to the power plant under a head of 500 feet.

The company is constructing a new building to be used as headquarters for the Paradise Camp. Next year the entire camp will be moved to the new location, which is nearer Paradise Inn.

The company is constructing a club building which will serve as guide headquarters and will contain an auditorium for meetings, lectures, and motion pictures.

The construction of an addition to Paradise Inn has been begun. The wing now being built will contain 104 rooms, 58 of them with private bath. These additional accommodations will be completed by July 1, 1921.

During the month of May the National Park Inn Annex, at Longmire Springs, was moved across the road. This gives it a better location and improves the appearance of the buildings at Longmire Springs and enables it to be more conveniently operated in connection with the National Park Inn.

The old Longmire Hotel was dismantled and burned on May 17.

The company has done considerable work in cleaning up and improving the mineral springs and their surroundings. The soda and iron springs have been inclosed by masonry walls and walkways have been constructed.

GASOLINE SERVICE STATION.

The Standard Oil Co. opened its service station at Longmire Springs on June 7 and supplied several thousand cars during the season. A gasoline shortage has existed on the Pacific coast during the summer, and the supply of gasoline has been restricted. Throughout most of the season, however, the service station has been able to supply visitors with sufficient gasoline for use in the park and for the return trip, at least as far as Tacoma.

INFORMATION BUREAU.

Information bureaus were maintained at the park entrance and at the superintendent's office at Longmire Springs. Circulars descriptive of this and other parks were distributed, maps and Government publications regarding the park were kept on sale, the many inquiries were answered, and visitors were directed to points of interest.

PARK HEADQUARTERS.

The park headquarters were moved from Longmire Springs to the park entrance at the close of the season, on October 21, and were moved back to Longmire Springs on May 11. Throughout the summer season the headquarters are maintained at Longmire Springs.

WEATHER.

An unusually cold spell was experienced during the week from December 7 to 14. A temperature of zero was recorded at park entrance, 7° below zero at Longmire Springs, and 8° below zero at Paradise Valley.

The early months of the winter were open and the snowfall much less than average. During the latter part of March and April there were several storms that brought the depth of snow to about an average condition. The maximum depth at Longmire Springs was 30 to 36 inches and the maximum depth at Paradise Valley was 16 feet on April 20.

The weather in the summer season was, in general, very favorable, and an unusual number of fine clear days were enjoyed by the visitors.

APPROPRIATIONS.

The appropriation for the park for the year ending June 30, 1920, was \$82,500. The appropriation for the park for the year ending June 30, 1921, was \$40,000.

REVENUES.

The revenues received at the park and forwarded to Washington during the fiscal year 1920 were as follows:

Receipts from automobile entrance permits-----	\$21, 778. 50
Miscellaneous receipts-----	673. 41
Total receipts-----	22, 446. 91

ULTIMATE DEVELOPMENT OF THE PARK AND THE CARBON RIVER ROAD.

The developed area of the park, or that which is accessible to the average visitor, does not exceed 5 per cent of the total area of the park. The remaining 95 per cent contains many areas that equal or surpass in beauty and attractiveness the area now accessible.

The plan adopted by the park service for the ultimate development of the park contemplates the construction of a road around the mountain. The first step toward this plan is to be a road up the Carbon River, to or near the Carbon Glacier. This road would then be extended along the west side of the park, to Mowich Lake, and thence to a connection with the present Nisqually Road at Tahoma Creek. Another element in the plan is the construction of a road starting from the Nisqually Road at Narada Falls and leading down Stevens Creek, thence over the Cowlitz divide to the Ohanapocoosh Hot Springs, at the southeast corner of the park. Another road would run up the Ohanapocoosh River; thence along the eastern side of the park to White River; and there connect with the road now under construction by the State and Federal Government, to the White River entrance of the park.

The completion of this road will require many years, even if it is begun at once and carried on actively. It is desirable that several miles of this road be constructed each year, so that the ultimate completion will not be unnecessarily postponed.

For the year 1922 this construction would take place on the road up the Carbon River. This region is closer to both Tacoma and Seattle than the portion of the park now accessible by the Nisqually Road, and its scenic beauty and superlative attractions make development of this region most desirable. The development of other areas of the park is important to divert some of the travel which is rapidly exceeding the facilities and accommodations available in the southern portion of the park.

WHITE RIVER ROAD.

The State and Federal authorities are now constructing a road up the White River to the park gateway. A road was formerly constructed inside of the park by a mining company to Glacier Basin, a distance of 10 miles. The lower 3 miles of the road was reconstructed by the park service, and surfaced for a distance of 2 miles, but is in need of maintenance. The road above this point is not passable for automobiles at the present time, and requires reconstruction and relocation to make it suitable for an automobile highway. The condition that will exist next year will be that automobiles will travel over excellent roads to the park entrance, but will be unable to proceed farther. The park service wishes to devote its principal expenditure for the construction of a new road toward the opening of the Carbon River section of the park, which is the area in which the development work is most desirable. However, in view of the fact that a first-class approach road will be completed to the White River entrance, it would seem desirable to make some development in this section of the park. A provision for the maintenance of the present road along the White River, inside of the park, is desirable in order that the road may be made passable for the greatly increased travel that will visit this corner of the park during the coming season.

CRATER LAKE NATIONAL PARK.

ALEX SPARROW, Superintendent, Medford, Oreg.

GENERAL STATEMENT.

Crater Lake National Park was created by act of Congress approved May 22, 1902 (32 Stat., 202). It is located on the crest of the Cascade Mountains, in the southwestern part of Oregon, about 60 miles from the California line. It is approximately 13½ miles east and west and 18½ miles north and south, embracing an area of 249 square miles.

DESCRIPTION.

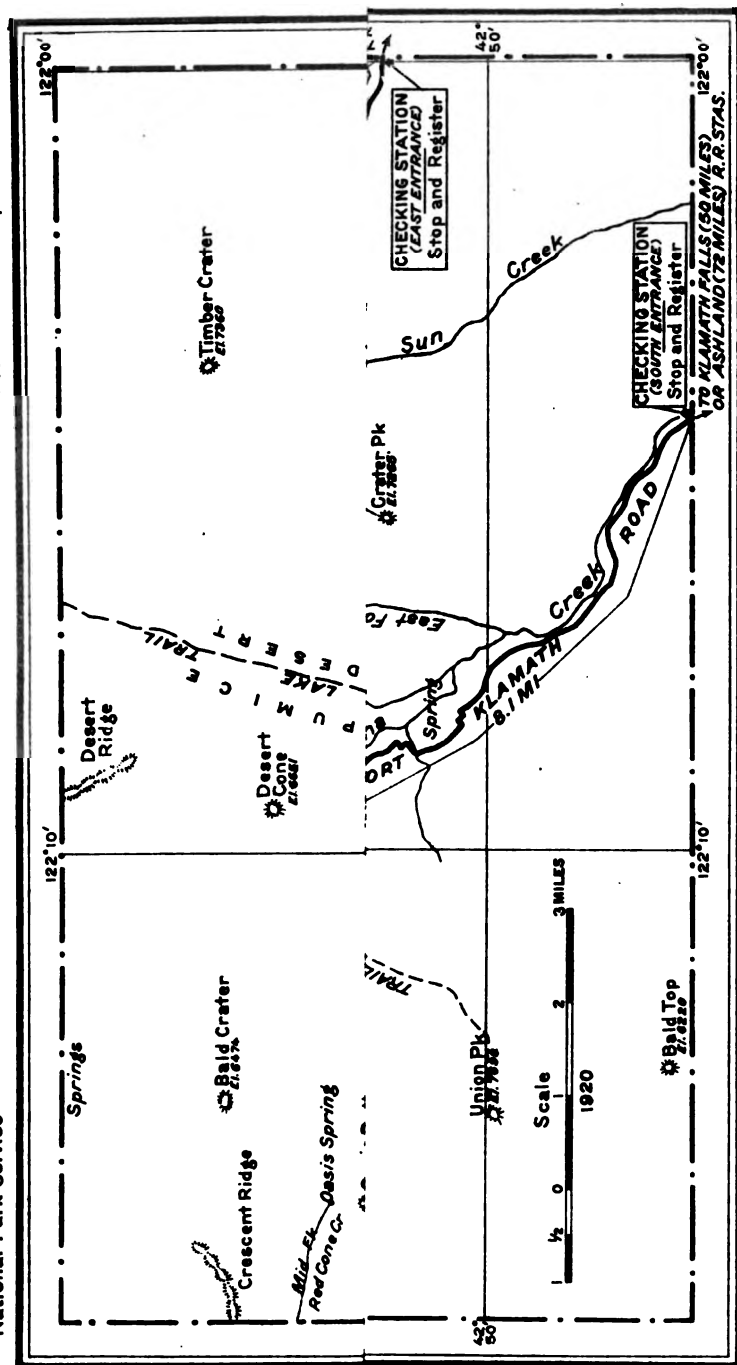
Crater Lake is one of the greatest of natural wonders, due to its remarkable geologic history, great depth, and intensely blue color. It lies in a great basin or caldera formed, it is supposed, by the subsidence of the upper part of a volcano, which has been named Mount Mazama. The lake is almost circular in form, with an average diameter of 5½ miles, and is completely surrounded by precipitous cliffs rising sheer from the water to heights varying from 600 to 2,000 feet. It has the remarkable depth of 2,000 feet, and is said to be the deepest body of fresh water in America.

Near the west shore of the lake a volcanic cone rises to a height of 800 feet above the surface of the water, and has a well-defined crater, about 100 feet deep, at its top. This is Wizard Island, a crater within a crater, and surrounded by pure crystalline water of an unbelievable blue color when viewed from the rim of the lake over a thousand feet above its surface. There is no known outlet to Crater Lake. The water varies but a little in temperature, being uniformly about 38° F.

Other points of interest within the park are the wonderful Castle Creek, Anna Creek, and Sand Creek Canyons. Here are seen the effects of ages of erosion in carving weird canyons with precipitous sides hundreds of feet deep. Within these canyons, especially the last named, are to be found wonderful sand pinnacles rising from the canyon floor and sides like a forest of stone; and in all are many grotesque and fantastic figures of stone, giving evidence of the caprice of the forces that formed them.

TRANSPORTATION.

The nearest railway points are Medford, Oreg., 81 miles distant on the main line of the Southern Pacific, and Klamath Falls, Oreg., 62 miles distant on the branch of the Southern Pacific, which leaves the main line at Weed, Calif. First-class tickets between Oregon and California points are good via Crater Lake with addition of stage fare. Regular daily stage service is maintained by the Crater Lake Co. between Medford and Crater Lake and Klamath Falls and Crater Lake during the months of July, August, and September.



MAP OF CRATER LAKE NATIONAL PARK

REPRODUCED FROM THE U.S. GEOLOGICAL SURVEY

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ACCOMMODATIONS.

Crater Lake Lodge, located directly on the rim of the lake 1,000 feet above the water, is an attractive building of cut stone capable of accommodating about 120 people. The lodge is now electric lighted by a Delco plant installed this season. At Anna Spring Camp, 5 miles from the lodge on the Klamath Falls-Medford Road, accommodations are furnished at cheaper rates. Groceries, gasoline, and motor oil may also be obtained at Anna Spring Camp. Throughout the park free public camp grounds are available, subject only to the regulations of the National Park Service.

BOATING.

Boating on Crater Lake is becoming more popular each year, and the boating facilities have been greatly improved since the opening of the present season. One launch, 3 smaller power boats, and 13 rowboats have been in operation since July, and a 40-passenger launch is nearing completion. Two daily launch trips on schedule are made around the lake touching at Wizard Island and the Phantom Ship. These trips afford an excellent opportunity to study the formation and enjoy the vivid coloring of the cliffs.

FISHING.

Fishing from rowboats is an attractive feature to those enjoying this kind of sport. Trolling is the method employed by the most successful anglers, and no trouble is experienced by those using the right kind of tackle in taking the limit, which is five fish a day per man. The trout range in weight from 13 to 4 pounds. No. 5 hooks with spoon or spinner, copper on one side and silver on the other, make the best equipment, but good results are often secured by use of a fly.

GAME.

Of the wild life in the park the most frequently seen are deer, bear, porcupines, marmots, pine martins, squirrels, and at least two species of chipmunks. Predatory animals comprising cougar, lynx, bobcats, timber wolves, and coyotes are sometimes seen, and an effort is being made to exterminate them.

Though bear make frequent visits to the construction camps in search of food, they appear less numerous than last season when they could be seen almost any day and furnished considerable entertainment for tourists. That they are fewer in numbers this season is probably due to their ceasing to fear man and his works and hence were easy victims of hunters and trappers when they left the park for their winter quarters.

The numerous varieties of birds within the park are increasing from year to year, due, no doubt, to the exclusion of firearms from the park.

WEATHER CONDITIONS.

Fine weather prevailed throughout the season. Though abnormally warm in the surrounding valleys during July and August, the temperature in the park was delightful, and many local people visited the park during these months to escape the heat. The first storm of the season occurred August 27, 28, and 29, during which time about 1 inch of snow fell above the 8,500-foot level. The sun was shining bright and clear on the 30th and all signs of the previous storm were gone.

TRAVEL.

After strenuous efforts, snow plowing and shoveling, the road to Anna Spring via the south entrance was opened for cars on June 13, and from the west entrance on the 17th. The road from Anna Spring to the lodge was passable for automobiles June 26, and the Rim Road around the lake on July 26. This is the earliest opening of roads within the park of which we have any record.

In spite of the shortage of gasoline in the adjacent States the season's travel is in excess of previous years.

Statement showing automobile travel, by States and entrances, season of 1920.

States.	East entrance.		South entrance.		West entrance.		Total.	
	Cars.	People.	Cars.	People.	Cars.	People.	Cars.	People.
Alabama.....			1	4			1	4
Arkansas.....	1	4			2	6	3	10
Arizona.....	1	3	6	23	6	19	13	45
California.....	128	410	556	1,800	567	1,814	1,251	4,024
Colorado.....	5	17	6	23	9	29	20	69
Connecticut.....					1	2	1	2
Florida.....			1	4			1	4
Illinois.....	2	11	1	4	7	36	10	51
Indiana.....	1	4	3	10	4	18	8	32
Iowa.....	3	10	5	14	2	16	10	40
Idaho.....	15	46	9	35	9	34	33	115
Kansas.....	3	10			2	5	5	15
Kentucky.....					3	8	3	8
Louisiana.....					1	2	1	2
Maryland.....					1	4	1	4
Massachusetts.....					3	19	3	19
Montana.....	2	7	1	4	1	8	4	19
Michigan.....					3	14	3	14

Statement showing automobile travel, by States and entrances, season of 1920—Continued.

States.	East entrance.		South entrance.		West entrance.		Total.	
	Cars.	People.	Cars.	People.	Cars.	People.	Cars.	People.
Minnesota.....	1	1	2	4	6	28	9	38
Missouri.....	8	16	1	2	6	18	15	39
New York.....	1	1	2	5	5	45	8	51
New Mexico.....	1	3			1	2	2	5
New Jersey.....					2	2	2	2
Nebraska.....	4	18			6	26	10	44
Nevada.....	4	17	13	39	9	29	26	86
North Carolina.....					1	4	1	4
North Dakota.....					1	4	1	4
Oklahoma.....			1	5	2	11	3	16
Ohio.....	4	11	2	4	10	34	16	49
Oregon.....	320	1,163	1,177	4,340	1,899	6,675	3,396	12,178
Pennsylvania.....					5	32	5	37
South Dakota.....					2	7	2	7
Texas.....	2	6			6	18	8	24
Tennessee.....					1	5	1	5
Utah.....	2	4	6	20	4	16	12	40
Virginia.....	1	3			2	4	3	7
Washington.....	31	97	46	172	70	204	147	473
Wisconsin.....	1	3			1	8	2	11
Wyoming.....			6	16	5	12	11	28
District of Columbia.....	1	4					1	4
Hawaiian Islands.....					2	4	2	4
Total.....	542	1,899	1,845	6,528	2,667	9,220	5,054	17,617
Automobile travel unclassified by States.....							104	274
Total all motorists, classified and unclassified.....							5,158	17,891
Total visitors, other means of transportation.....								966
Total visitors hauled by Crater Lake stage.....								1,278
Grand total visitors, motorists, and all other.....							5,158	20,125

SPECIAL VISITS.

The congressional Appropriations Committee, accompanied by the Director of National Parks and the vice president of the Southern Pacific Railroad, visited the park July 11 to 19; and although reservations were booked in advance for this party, the lodge was not prepared to adequately care for them. This caused considerable criticism, not the least of which came from the Director of National Parks, who reprimanded the proprietor and threatened to cancel the concession of the Crater Lake Co. One of the causes leading up to the unsatisfactory service at that time can be attributed to the fact that the lodge was not opened in time to get things in working order or the crew organized before tourists began to arrive in larger numbers than had been anticipated. If nothing more comes of the controversy started at that time, it has justified itself in improving the service for the current season at least, but there can be no doubt that the publicity given the incident reduced our travel to a large extent, for in some manner the impression got out, about July 15, that this park was closed, and many intending visitors passed us by.

ROADS.

The 57 miles of road comprising the park system is made up of the following units. Pinnacles Road, from Rim Road at Lost Creek to east entrance, 8.25 miles; Fort Klamath Road, from Rim Road at Government camp to south entrance, 11.4 miles; Medford Road, from the west entrance to Anna Spring, connecting with Fort Klamath Road, 6.84 miles; Rim Road around Crater Lake, 35 miles.

The maximum grade on any of the park roads is 10 per cent, and grades this steep occur in very few places and obtain for short distances only. For dirt roads the park system is very good, and numerous complimentary remarks have been made by tourists to this effect.

The Rim Road, which comes to the verge of the lake rim at numerous vantage points, affords a magnificent view of the lake and encircling walls from different elevations and angles; also a vast panorama on both sides of the Cascade Mountains.

TRAIL SYSTEM.

The 34 miles of trail within the park is composed of the following units: Lodge to lake, passable for saddle horse or foot travel, 1.2 miles; Wizard Island, from boat landing on Wizard Island to the top of the cone, a foot trail of easy ascent, 1 mile; trail to Garfield Peak from the lodge is passable for saddle horse or foot travel, 1.3 miles; from lodge to Watchman Peak along the rim of the lake, passable for horses, 3.5 miles; Dewie Trail, via

the Garden of the Gods, is passable for automobiles and affords a good view of Anna Creek Canyon and Dewie Falls, 2 miles. The trail from Anna Spring to the Rim follows the old wagon road and is passable for light horse-drawn vehicles, 4 miles; Union Peak Trail from the Medford Road to the base of Union Peak is passable for light vehicles for about 3 miles, the remaining distance is a good saddle-horse trail, 4 miles; Sun Notch Trail from the Rim Road to Sun Notch on the lake rim is passable for autos for 1 mile, and the remaining half mile is a good foot or horse trail, 1.5 miles; Crater Peak Trail is practicable for light vehicles for $1\frac{1}{2}$ miles and for foot or horse travel the remaining three-fourths of a mile, 2.25 miles. A trail to the north boundary of the park was built this season which is practicable for light vehicles for the entire distance of 8 miles.

TELEPHONE SYSTEM.

The park system of telephone lines consists of 54 miles of line within the park and 14 miles between the east entrance and Kirk, the terminus of the railroad. The west entrance is connected with Prospect, 18 miles distant on the Medford Road, by a line in which the park service has an interest. This line is valuable chiefly for fire protection and 9 miles of it is maintained by the Forest Service. The park system connects at the south entrance with the Klamath Telephone & Telegraph Co. line to Fort Klamath, 9 miles. Under an arrangement with the Klamath Telephone & Telegraph Co. they are allowed free use of park service lines in exchange for which they maintain 8 miles of park line from the south entrance to Anna Spring for 10 months and 5 miles of line from Anna Spring to Crater Lake Lodge for 4 months each year. The company also keeps telephones in repair on these lines and gives free service for all Government business between the park and Fort Klamath.

FIRE LANES.

During the fiscal year 1920 brush was cut from a strip 8 feet wide around the park boundary as a precaution against forest fires and to aid prevention of trespass by stockmen and game poachers. All trees within this strip were blazed on two sides.

FOREST FIRES.

One fire occurred within the park during the season, located about a half mile north of Arrant Peak. Two acres were burned over, but no timber of any value was destroyed. This fire was discovered and put under control August 14. On August 16 a fire was reported southeast of Mount Scott and two rangers were sent to locate it and found it to be about 2 miles outside the park in the forest reserve. They put it under control and remained with it until safe to leave.

RANGER SERVICE.

The ranger force consists of six temporary rangers; one is employed throughout the year at Anna Spring, three at the entrance stations during the tourist season, and two on patrol. One permanent clerk-stenographer is employed.

CRITICISMS AND RECOMMENDATIONS.

During the early part of the season the service at the lodge came in for considerable criticism, most of which was justified. This was due, in part, to lack of preparation before the season opened, and inefficient organization, and lack of sufficient supplies. The lighting system was inadequate and the water system failed.

After much fault finding and criticism passed along orally and through newspapers, conditions were very much improved and for the remainder of the season but few complaints were received. A Delco lighting plant was installed which gives satisfactory service. A new pumping plant was installed, which was guaranteed to do the work, but failed entirely, and another unit is now in transit and will be installed at an early date. During this time water was furnished the lodge from the Government plant, which proved adequate for all occasions, but sometimes required a night shift to keep up the supply. Too much of the lodge is used to house employees, and it is my opinion that tents or separate buildings should be provided for the help, and if this were done the lodge, with some tents, should be sufficient to care for guests for another season or two. This would give time for mature consideration regarding future development, and it should be borne in mind that at least one whole working season would be required to complete a permanent building at this place. Regardless of what the plans are for the future, there must be some temporary arrangement made to take care of tourists during the 1921 season.

The public operator has many good boats and launches on Crater Lake, but as yet there is absolutely nothing in the nature of a dock or boat landing. It is recommended that a loose-rock and concrete pier or boat landing be constructed for the convenience of tourists and protection of boats, which are always grounded on rocks when taking on or discharging passengers. An estimate for this work has been submitted.

Attention is invited to recommendation of 1918 and 1919, regarding extension of the park 9 miles to the north, which would include Diamond Lake, Mount Baily, and Mount Thielson. If the territory in question contained timber of any commercial value, or grazing for enough stock to pay the salary of a ranger to look after them, I would hesitate to recommend its inclusion in the park. There are on file in your office statistics from Government officials to the effect that the timber is not merchantable and grazing for only 112 head of cattle and 1,400 sheep and their increase for 90 days. I have been on the Rim Road with hundreds of prominent people, where they could look over the territory, and they have been unanimous in the opinion that it should be included, in order to complete the present park and give us an outlet to the north. I am not in favor of setting everything of prominence aside as a park, but when a national park is established it should be large enough to let a scared bear or deer have a good run without going over the boundary to be killed.

WIND CAVE NATIONAL PARK.

ROY BRAZELL, Superintendent, Hot Springs, S. Dak.

GENERAL STATEMENT.

The Wind Cave National Park was created by the act of Congress approved January 9, 1903 (32 Stat., 785), which reserved for park purposes a tract of land comprising 10,522.17 acres, which tract was increased in 1912 by the purchase of 377.05 acres of adjacent tracts for game-preserve purposes, the total area of the park now being 10,899.22 acres. At the time the act was approved there were several tracts of privately owned land within the present boundaries of the park, but the Government has since secured title to all such lands and now has exclusive control of the entire area.

The park was established to protect and encourage a wide range of wild life—both plant and animal—and, primarily, to preserve for posterity the natural beauties and wonders of the Wind Cave, from which it derives its name, the cave in its turn getting its name from a peculiar intermittent draft of air blowing in or out at its entrance.

The park is located in the southwestern corner of South Dakota, 36 miles from the south boundary and 24 miles from the west boundary of the State, in the semi-mountainous region of the Black Hills, and is approximately 4 miles square.

The land within the boundaries of the park is about evenly divided between rolling prairie country, which offers excellent grazing facilities, and a mountainous area covered with a good growth of pine timber affording ideal natural shelter for game and stock during the winter months. The altitude at headquarters is 4,030 feet, while parts of the mountainous region in the western portion of the park reaches to an elevation of something over 4,700 feet.

The park is under the direct control of a superintendent, who is assisted by one park ranger, these being the only regular employees on duty in the park, though during the busy tourist and grazing season additional rangers are employed temporarily for guide service in conducting visitors through the cave, and for range riding and other duties.

THE CAVE.

Slightly north of the center of the park is located the entrance to one of nature's many interesting and baffling bits of handwork—the Wind Cave. The cave is by far the most wonderfully interesting feature of the scenic Black Hills.

Wind Cave is said to be the largest cave known to the world to-day and is considered the most wonderful because it combines all of the interesting and geological formations of all other known caves and in addition has many attractions which can be found nowhere except in Wind Cave. The trails within the cave have been developed to a certain extent and up to date three routes have been made accessible and opened to the public by the working out of passages and the installation of stairs, ladders, and bridges. The three trails over which visitors are now conducted are known as the Garden of Eden, the Fair Grounds, and the Pearly Gates, being a short, medium, and long route, respectively. It requires about two hours' time to complete the short trip through the cave and just a little more than three hours to properly see the longest one.

DISCOVERY.

The discovery of the cave has been the source of much speculation and any authentic information has been very hard to obtain. I have spent considerable time in the past five years collecting data on this subject and I find that there are at least 8 or 10 men who claim the distinction of having been the first to behold this famous cavern. However, after carefully tracing all stories relative to the discovery to their source, and after a comparison of the few authentic statements, I am convinced that the cave was first discovered by a deer stalker by the name of Tom Bingham, who, in February of 1881, was trailing, by means of blood and tracks in the snow, a wounded deer, whose path led down the canyon in which the entrance of the cave is now located. Mr. Bingham's attention was attracted by the wind issuing from a small opening in the rocks not more than 8 or 10 inches in diameter which, while investigating its source, blew his hat several feet into the air. According to the legend, while he was demonstrating this interesting phenomenon to friends the next day the wind, instead of blowing his hat into the air, drew it down into the ground, which incident led to the blasting out of the present entrance later in the summer of that same year.

One of the contenders for the distinction of discoverer of this cave was an interesting character known as Lame Johnnie, who gained quite a reputation as a cattle rustler and horse thief, and who was later hanged not far from the park near a creek which now bears his name.

DESCRIPTION.

It is practically impossible to accurately describe this cave, but a vague, general idea of what it is like can be formed by comparing it to a gigantic sponge whose dimensions are measured in miles instead of inches, for the various holes or passages of this cave extend in all directions and at all angles. Old guides are authority for the statement that people have been down into this cave more than 1,500 feet below the entrance and that the end or bottom of it has not as yet been found, with over 100 miles of explored passages traversed to date. So far as known, there is but one entrance or opening to the cave. The extent and number of the various crevices, cross ovens, and chambers which make up the cave no one knows, nor can anyone intelligently guess, though we do know that the part now open to the public is a very small fraction of that part which has been explored but not surveyed. Beyond this the wildest guess is permissible.

The cave is made up of a series of tiers or levels similar to the stories of a house, not nearly so abrupt but being more crude, of course, and a system of crevices extending downward and to the southeast, these crevices being intersected at right angles, approximately, by what the guides have named "cross ovens." The floors or divisions between the several levels vary in thickness from 3 or 4 inches to possibly 75 or 100 feet. In some places

It is but a mere crust, and a peculiar ringing or hollow sound can be heard when the floors are struck with a hammer or other heavy weight, and in a few places this hollow sound can be heard while one is simply walking across the thin spots. This cave claims the distinction of having the largest natural underground chamber in the world. The Fair Grounds chamber, with its various galleries, at the end of the medium-length route, is a large irregular T-shaped room covering between 4 and 5 acres of space or rock and ranges in height from 10 to 40 feet to the ceiling.

The wind cave is outlined in a strata of what is known as Pahasapa limestone. All natural caves, I am informed, are found in some form of limestone. This one is classed as a dry cave though it is caused by the action of water. It is not due, however, to the mechanical action of water as most people are led to believe, but shows here more of the chemical reaction of hot water on a limestone composition. In all probability the openings or crevices of the cave were originally started as a result of the earth's movements and were later enlarged by the chemical reaction of water. In places within the cave the walls are found to be lined with a crust or deposit which was left by receding hot waters, this crust resembling closely the deposit found on the inside of a used tea kettle. In other places the cave is brilliantly beautiful; the walls and ceilings being covered with dazzling crystals of various colors and shapes, which scintillate almost incredibly in the artificial light carried by the guides and members of the party. One can but corroborate the following statement which has been made regarding the beauties of the cave: "The various formations within it are a most wonderful exhibit of diversified beauty and inimitable work of nature."

INTERESTING FEATURES.

The most interesting feature of the cave is a peculiar draft of air blowing in or out at the entrance at different times. This current of air has no regularity either as to direction or velocity. There are times when it will blow steadily in or out of the cave for several days at a time. At other times it has been known to change almost instantly; changing in less than five minutes. Still at other times no agitation is perceptible, there being no wind going or coming in either direction.

There are several theories advanced as to the cause of this wind, some people maintaining that there is another opening to the cave some place and that the wind blows clear through. Others advance the theory that it is caused by subterranean passages of water down in the lower levels of the cave beyond any of those yet explored, and that the rise and fall of these waters creates the pressure or suction to force the air out or draw it in, as the case may be.

The accepted theory, however, is that the wind is due to atmospheric pressure on the surface, and I find it to be a very good barometer, indicating a change in the weather from four or five hours to a whole day in advance. If the barometer is falling outside the air will be going into the cave, indicating a change for the worse; and if the barometer is rising outside the air will be coming out of the cave, indicating a change for the better.

There are times when the wind will rush out of the cave with such terrific force that it requires the strength of two men to open the door at the entrance so that one may get into the cave. After getting into the cave 200 or 300 feet one never notices the wind, regardless of how strong it may be at the entrance. This is accounted for by the peculiar funnel-shape arrangement of the cave as a whole. The same volume of air in all probability is moving throughout the cave but as there is such a vast space for it to spread out in it is not noticeable, while at the entrance it must of necessity pass through the small funnel-like opening with much greater velocity.

Another interesting feature of the cave is the purity of the atmosphere within it. Even down on the lowest levels yet explored the air is very pure and invigorating, and sufferers from asthma or hay fever get instant relief from either of these diseases while in the cave. No one seems to know exactly what effects this relief, some claiming that it is due to the entire absence of vegetation within the cave; others maintaining that it is caused by an unknown ingredient which scientists say is in the air in the cave but which they have as yet been unable to name; and still others claim that it is due to the temperature. The temperature in the cave, by the way, is about the same the year around, fluctuating but 5°—from 42 to 47°. This seems uncomfortably cold, and, to use the expression, one can "see one's breath" at any point within the cave, but owing to there being no direct draft down on the lower levels and to an overabundance of oxygen in the air a very little exercise keeps one comfortably warm. To emphasize the point about the oxygen in the air the guides will demonstrate with a lighted candle, calling one's attention to the brilliant white light and the larger flame of the candle while burning in the cave, as compared to the small yellow blaze while burning outside of the cave.

FORMATIONS.

The predominating formations within the cave are the calcite crystals, exposed geodes, stalactites, stalagmites, aragonite, quartz, a peculiar box-work formation, and the usual mineral-bearing rocks. There are several known varieties of calcite, and many of these are found in Wind Cave.

At one point within the cave there are two large, exposed geodes side by side, practically touching each other. These geodes differ in structure and content and it is believed by some geologists that they were formed in different ages, in all probability thousands of years apart. At another point is one of the very few cold-water formations found within the cave and which is still growing or forming. The interesting feature of this formation is the fact that a little vinegar sprinkled upon it will cause it to effervesce. The stalactites and stalagmites of the cave are very small and not very numerous, as they require considerable moisture in their formation, and as this is a dry cave we have but a limited number. There is, however, a spring miniature lake in one portion of the cave on one of the upper levels, but aside from this it is without moisture except for condensation of the atmosphere and here and there a little seepage from the surface.

Our geodes are small spherical structures, usually about the size of a baseball; hollow, with the exception of prismatic formations, which form a lining. These prisms or crystals have their apices directed toward the free space and are commonly composed of quartz, though not always.

RAILROAD FACILITIES.

The entrance to the cave is located about 12 miles north of Hot Springs, which is our main railroad city. The Chicago, Burlington & Quincy and the Chicago & North Western railroads run branch lines to Hot Springs, and together have built a neat little union depot to handle the passenger traffic. Most of the people traveling by rail, who visit the cave, do so from Hot Springs, coming by hired conveyance from that city though other accessible railroad towns are Buffalo Gap, 12 miles distant on the Chicago & North Western Railroad, and Pringle and Custer, 9 and 22 miles distant, respectively, on the Chicago, Burlington & Quincy Railroad. Hot Springs is but an overnight ride by railroad from Omaha, Denver, or Billings.

Our post-office address is Hot Springs, S. Dak., the mail being brought to the park by our transportation concessioner.

TRANSPORTATION.

Since January 1, 1919, Mr. Bert Underhill, of Hot Springs, S. Dak., has had the exclusive right of transporting for hire passengers from that point to the park, and up to date he has given the best of service. There was considerable opposition to this plan when it was inaugurated, and during the busy tourist season of 1919 several protests were made against this method of handling the passenger traffic. These protests, however, did not come from the tourist whom the plan was meant to benefit, but were instituted by an interested few who for mercenary reasons were trying to have the system abolished. The transportation problem for the past five years has caused us considerable annoyance, but since the inauguration of the present system we have not had a single complaint from the traveling public. In fact, the system is giving the best of satisfaction, and I have but words of praise for it.

No permits have been issued for transporting passengers from towns other than Hot Springs, though to afford our public operator a measure of protection an emergency permit fee of 50 cents a passenger is exacted from liverymen from the other neighboring towns when they haul passengers to the park for hire. This system, too, seems to be working out very satisfactorily.

VISITORS.

In spite of the adverse weather conditions we have had to contend with throughout practically the whole season, the number of visitors to the park this year shows a slight increase over last year.

There were 27,083 visitors to the park during the season just closed; 25,050 people came in 7,888 private automobiles and 1,973 people were carried by the public transportation operator. There were 6,680 visitors who made the trip through the cave.

As a whole the weather conditions throughout the entire season have been decidedly unfavorable for tourist travel, the roads in this section of the country, including all of the Black Hills and parts of Nebraska and Wyoming, having been in an abominable condition and practically impassable up until the month of August. There was a decrease in the number of motoring tourists this season as compared with last season. Our records show that a much greater percentage of the visitors to the park came into the Hills on the train than has been the case in the past. Many of our visitors reported that on account of weather and road conditions they were forced to abandon their automobiles at various places within a radius of 150 miles of the park and finish their trip by train. It is also reported that a great many of the motoring tourists gave up their trip entirely and turned back when they encountered washed-out bridges or other inconveniences that made traveling here so disagreeable this season.

Practically every State in the Union and many of the foreign countries sent visitors to the park this season, but the following percentages show that most of our visitors come from this and near-by States:

South Dakota, 45.8 per cent; Nebraska, 25.3 per cent; Iowa, 7.4 per cent; Wyoming, 3.7 per cent; Kansas, 8 per cent; Illinois, 3 per cent; Minnesota, 2.3 per cent; North Dakota, 2 per cent; Missouri, 1.1 per cent.

It is, indeed, very gratifying to note that practically every visitor to the cave seems more than pleased, and the people each year are becoming more and more interested in our national parks, and, as a whole, are beginning to appreciate and understand the work of the National Park Service and its aims. Without the good will and the cooperation of the people as a whole, all of our efforts will have been wasted. Visitors can not but respond to the good treatment, courteous reception, and efficient service which is invariably accorded them in the national parks, and the policy of remembering that we are here to serve, anticipate the desires of, and in every way assist the visitor in making his trip worth while, should be adhered to as in the past. The National Park Service has earned the good will of the people in this way.

The steady increase of visitors to this park makes but slight change in the percentage of visitors from near-by States, South Dakota and Nebraska still providing more than 70 per cent of the entire list. This emphasizes the situation that this park is not well known at much distance, and, complimentary to the park, where best known it is best patronized.

On account of the time required for each trip in the cave but two trips are undertaken each day—9 a. m. and 2 p. m. As a result of information signs along the main roads leading to the park and the exploitation that has been given the park locally, but very few tourists were disappointed this season by reaching the park out of time for the regular trips. It has been the custom to discontinue the forenoon trip during the period from October 1 to April 30.

SPECIAL VISITORS.

On the 16th of August this park entertained Baron Eugen Fersen and his mother, the Baroness Modem, of Moscow, Russia. This, I believe, is the first nobility this park ever entertained. They expressed themselves as being very well pleased with their trip and were much interested in the park.

This park was very fortunate in being visited by Mr. Arno B. Cammerer, Assistant Director of the National Park Service, from the Washington office, during the summer.

This brief visit of only a day and a night can not but redound to the benefit of the park in every way. The service, through first-hand information acquired on the ground, is more intimately acquainted with the park, its problems, and its needs.

ROADS AND BRIDGES.

The main road through the park is about 6 miles in extent, and constitutes a part of the Denver-Deadwood Highway, known as the Triangle D. Road, the Black Hills portion of which is noted for its panorama of beautiful scenery.

The roads within the park have been in exceptionally good shape all season, considering the adverse weather conditions, with which we have had to contend. Our maintenance work has been seriously impeded throughout the entire season by an unusual amount of rainfall.

On October 4, 1919, we had our first snow, and this snow was not entirely gone until the 26th of the following May. Several heavy storms occurred during the winter months, and on the 16th of April we experienced a severe blizzard. Snowdrifts 25 feet deep were not uncommon. This snow was finally thawed by spring rains and so thoroughly saturated the ground that road work was practically impossible. The moisture soaked into the ground to such extent that the foundations of our roads were seriously impaired, and an unusual amount of rain fell during the balance of the summer season, which put the roads in such condition that they required constant attention. A small 4-horsepower tractor was very effective in keeping them open for travel.

The roads within a radius of 150 miles of the park have been in an abominable condition, some of them being impassable and not open to travel for weeks at a time. Several large bridges in this community were washed out, which, of course, closed those roads until temporary structures could be installed.

As stated in previous reports, our bridges are in a very poor state of repair and should be replaced with new ones at once. In fact, one of them is in such condition as to be unsafe for travel and is actually dangerous. This is entirely due to lack of funds. We have done all we consistently could with our meager appropriations. For this same reason we have not attempted any construction work on our roads for the past two or three years, and our maintenance has been a hard-fought losing battle against retrogression.

Through the rainy season, when all roads were in very bad condition, we were able by constant attention to keep our park roads up to a higher standard than those immediately adjacent, but now when the neighboring communities are rebuilding their roads we are hampered by lack of funds and must submit to some humiliating criticism.

As a whole we have the best of road-building material and an ideal, natural roadbed, the soil having considerable rock, sand, and gravel mixed with it. The construction work that was started when funds were available for that purpose was all done with a view to making a permanent hard-surfaced road at some future time.

INFORMATION SERVICE.

For the past two years we have tried to maintain an information bureau at the park headquarters particularly for the benefit of the motoring tourist, and have met with the best of success and have been getting some good results. We not only supply information regarding this and other national parks; how to get to them and condition of roads leading to them, but also the hotel accommodations and garage facilities throughout this section of the country; the points of interest near the park and how best to see them, and the location of the best camp sites. We help the tourist plan his itinerary, so that he can get the best out of his trip and see all that is possible of this park and the Black Hills in a given length of time. In short, we assist the tourist all we consistently can and do everything possible to make him feel welcome and at home in his national park.

Circulars of general information, road maps and cards, and other matter of interest and value to the traveling public are distributed from this office. The Government information pamphlet of this and other national parks is in great demand and is of inestimable value to the traveler. These should be available in larger quantities.

BUILDINGS.

The park buildings consist of a superintendent's residence, which is of stone with a frame addition and is modern and commodious; a good frame barn with carriage room, hay loft and stalls for five horses; a three-room frame administration building equipped with inside toilets and lavatories; an open auto shelter for use of tourists; a camp pavilion; building over entrance to cave; an ice house, and a blacksmith shop.

The building over the entrance to cave and the blacksmith shop are dilapidated and unsightly and should be razed and replaced by new buildings.

OTHER IMPROVEMENTS.

The superintendent's residence and the administration building are provided with modern septic sewer vaults which have served successfully since their installation in the spring of 1918.

We have about 3 miles of drift or cattle fence, three wire; a small pasture near headquarters of four-wire fence; a strong, serviceable corral at barn; cement walks and crossings; cement driveway in front of public buildings; an ornamental iron fence around grave and statue of original guide and explorer McDonald; some substantial iron guard railing, and near the public building a footbridge across a deep canyon. We also have several hundred feet of stairways, railing, platforms, bridges, and walks within the cave, and about a mile south of headquarters is a dam which creates an artificial lake about 3 acres in extent. There is a private telephone line from headquarters to the home of the warden of the game preserve. Length, about 2 miles.

WATER SUPPLY.

The source of our water supply is a spring located in the big game inclosure about a half mile distant from and 150 feet higher than the superintendent's residence. A three-fourths-inch galvanized pipe line conducts the water from the spring to a cement and rock

reservoir, which is built underground, has a capacity of 450 barrels and is located near headquarters at an elevation of 70 feet above the buildings.

Water is conducted from reservoir to the buildings, fountain, and at various hydrants on lawn, street, and at barn. The spring and reservoir are insect proof, the water is excellent pure, and, with care, is of ample supply. The water system has worked perfectly and without repair since being constructed in 1915.

STREAMS.

There is a stream which skirts the park on the north, crossing and recrossing the boundary at various points. This is the only permanent, running water on the park. It provides very fair trout fishing and has been stalked by the superintendent a few times. At three places on the park are springs which, if developed and protected, would provide water for several hundred cattle; this should be done.

BIRDS.

More than 60 varieties of birds are here in the park during the summer season and a few are all-year inhabitants. Prairie chickens, grouse, and a few ducks raise broods here, but migrate south for the winter. Some grouse and chickens stay here all winter, and while protected from hunters on the park lands, they do not confine themselves to the reservation, and many are shot. This and the very severe winter experienced has caused a noticeable decrease in the number of grouse and prairie chickens since last season.

There are a few quail and pheasants on the park which seem barely to hold their own from year to year against the climate, predatory animals, and poaching.

GAME PRESERVE.

The Wind Cave National Game Preserve was established by the act of Congress approved August 10, 1912 (37 Stat., 293), making appropriations for the Department of Agriculture. The preserve is located in the northwestern portion of the park and comprises about 4,000 acres, inclosed by a substantial woven-wire fence 88 inches high.

At present the game within the inclosure number 60 bison, 20 antelope, including a young, and 105 elk. In addition there are a few native deer which were accidentally caught on the inside when the fence was built in 1914. Excepting for the antelope, the animals have done remarkably well, particularly this season, as there is an abundance of the best kind of feed and plenty of water in the pasture. The antelope do not increase very rapidly; in fact, they have but just nicely held their own for the past five years. This lack of increase is rather hard to account for, as the antelope are not kept closely confined and this range was their natural habitat in the early days.

The past winter has been a very severe one on the game, and a few of the bison and antelope died as a result of the storms. One of the big 9-year-old bison and two of this spring's calves were killed, and four of the matured antelope died during the blizzard of April 18, 1920, or as a result thereof.

PREDATORY ANIMALS.

The coyote, bobcat, skunk, and porcupine are very common on the park, and the weasel, mink, and ermine are present in small numbers. Rodents are quite numerous and some of them may rightly be classed as pests.

As we are all inimical to the coyote, he is becoming less numerous in this vicinity, but owing to his shrewdness and hardihood and the plentitude of his natural food—mice, prairie dogs, rabbits, grouse, etc.—he will be with us for some time.

GRAZING.

Permits to graze cattle on the park were issued to the surrounding ranchers; the consideration for such, though nominal, aggregates a substantial revenue. Permits for all head of cattle are now in force at the rate of \$2 for each animal. No stock except cattle are permitted to graze on the reservation.

On account of limited capacity it is impossible to accommodate all who annually apply for permits to graze cattle on the park lands and we are constantly criticized for this unavoidable condition. It is the policy of the park management not to overstock the range and in consequence the cattle have plenty to eat and do very well.

Owing to the diverse duties of the park rangers, who are necessarily otherwise engaged most of the time, we have been unable to successfully cope with trespassing stock on the park range until this year, when some of the permittees provided a ranger to look after the park cattle and report to the superintendent all cases of trespassing and abuse of grazing privileges. The result has been quite satisfactory, beneficial alike to concessioners and the range. Grass is plentiful and cattle are fat.

FRANCHISES AND PERMITS.

The park allowed the following franchises and permits this year:

John Aaberg, T. B. Quigley, August Sanson, Albert Aaberg, Paul E. Martin, Olaf Aaberg, Elvin Aaberg, John Raver, J. L. McAdam, Smith Bros., and Robert McAdam, grazing permits.

Bert Underhill, transportation franchise.

A. A. Underhill, souvenir franchise, and various moving-picture permits, though none of the companies have availed themselves of this privilege.

REVENUES.

Revenues from all sources for the fiscal year ended June 30, 1920, aggregate, less exchange charges, \$3,801.45.

PLATT NATIONAL PARK.

THOMAS FERRIS, Superintendent, Sulphur, Okla.

GENERAL STATEMENT.

Platt National Park was created by acts of Congress July 1, 1902 (32 Stat., 641), and April 21, 1904 (33 Stat., 220), and comprises a total of 848.31 acres, lying just south of the town of Sulphur, Okla., and was formerly called Sulphur Springs Reservation, but was changed by joint resolution approved June 29, 1906, to Platt National Park.

Platt National Park is celebrated not so much for its beauty, and even this is called incomparable, as for its wonderful medicinal and fresh-water springs. This park contains only 848.31 acres and extends in a long irregular form, approximately 3 miles in length and having a circuit of about 9 miles. There are within the park a number of mineral springs and several nonmineral springs.

The principal groups are the Bromide, Medicine, and Sodium-Chloride Springs, situated in the western part of the park; the Beach, Pavilion, and Hillside Springs in the north central part of the park; and the Antelope and Buffalo Springs in the extreme eastern part; the latter are at an elevation of 1,080 feet above sea level and are nonmineral in character and have a flow, when normal, of approximately 5,000,000 gallons daily into Travertine Creek, and are the source of this creek. The Medicine and Sodium-Chloride Springs are of recent discovery comparatively. They have both been confined and protected from overflows and piped into bromide pavilion for use of visitors.

VISITORS.

Platt National Park, which borders the city of Sulphur, has no main entrance and there is no way of obtaining an accurate count of visitors; consequently the only method, with any degree of accuracy, has been to count all who visit Bromide Pavilion Springs for its waters. As this number does not represent individual visitors, but is made up from day to day of persons who make repeated trips to the springs, it is figured that about 20 per cent of the visits were by different individuals; therefore, I have estimated the travel to Platt as 38,000. This is an increase in the number of visitors over last year, and all indications point to a growth in numbers in coming years.

There were registered in the park office during this year 2,981 visitors, who came into the park and camped. This number is more than double that of last year and is but a small percentage of the total visitors, for the park is lined for 2 miles with hotels, rooming houses, boarding houses, and homes with rooms for light housekeeping to care for visitors.

As shown by the records of the Librarian at the Bromide Springs Pavilion, the visitors there from October, 1919, to September, 1920, inclusive, numbered 173,310.

Visitors to Bromide Pavilion by months.

October	5,844
November	4,347
December	3,418
January	4,384
February	6,067
March	7,546
April	9,052
May	12,017
June	19,339
July	41,954
August	44,467
September	11,873
Total	173,310

During the year a total of 40,251 gallons of bromide water was taken from the springs by visitors, as well as 10,657 gallons of the medicine water and 5,385 gallons of sodium-chloride water. (The Bromide Spring was held to capacity, the public using every gallon, and we were forced to stop shipment of bromide water during the crowded season.)

There was shipped from the springs 5,485 gallons of the three kinds of mineral water, making a grand total of all waters removed from the springs for the year of 61,776 gallons (aside from amount consumed at Pavilion), while last year 53,981 gallons was taken, and it can be readily seen that 7,795 more was used this year, indicating that a larger number of visitors were present this year.

WEATHER CONDITIONS.

This office has charge of the local weather bureau, and reports to the Oklahoma Bureau at Oklahoma City. Below is given a summary covering the weather conditions as they existed here last year from August, 1919, to July 31, 1920. This table shows that we had during the year a total rainfall of 41.09 inches, and that it was well distributed throughout the year.

Monthly summary.

Months.	Mean temperature.	Mean maximum.	Mean minimum.	Rain, in inches.	Months.	Mean temperature.	Mean maximum.	Mean minimum.	Rain, in inches.
August	85	97.2	72.8	7.27	February	45.4	58	32.8	0.11
September	74.1	84.4	65.9	.79	March	54.65	67.8	41.5	1.45
October	68.2	78.2	58.3	8.04	April	60.5	74.3	49.9	3.25
November	48	60.1	36	3.86	May	71.01	81.19	60.86	6
December	38.12	51.63	24.56	1.10	June	75.65	86.26	75.65	1.84
January	29.75	30.4	29.1	2.65	July	81.87	93.74	70	

CLIFFSIDE TRAIL.

This trail was constructed by former Superintendent Green during 1908 and consists of a footpath leading from the Pavilion Springs west across the park and thence along Bromide Cliff, descending by way of cement steps to Bromide Springs. The trail crosses a number of ravines spanned by small wooden bridges since its construction. It has been some years since any work was done to it and it should be thoroughly repaired and improved, and I am asking for funds to do this in my annual estimate for 1922.

FENCING.

During the past year we have built of woven wire a small buffalo and elk pasture and repaired part of the fences on the park.

We shall need a great deal more material for this kind of work, and I am asking for funds to keep fences in repair and to build needed new ones.

BUILDINGS.

During the year past there has been practically no repairs to any of the Government buildings on account of lack of funds. They are all in bad repair, and unless there is something done toward restoring these old buildings at an early date they will become uninhabitable and the expense of repairing will greatly increase.

If it is a bad policy for an individual to allow his buildings to disintegrate for lack of attention, why is it not for the Government, and even the superintendent's residence is no exception here.

I am asking for funds to do much work along this line and hope it may be available for next year.

ROADS.

It will be necessary to have the park roads resurfaced and broadened. These roads are built of native dirt or gravel and when packed it makes a fine roadbed, but they are worn and need to be resurfaced and repaired, and I am asking for money to do this work properly.

ANTELOPE AND BUFFALO SPRINGS.

These springs seem to be affected by some great volume of water somewhere and have gone dry three times in the last 27 years; but they resumed flowing early this spring, and there is apparently no signs of their going dry again.

These springs are the source of Travertine Creek, with its many beautiful falls and its windings in and out of the rocks along its source.

JULY 4 CELEBRATION.

On this date the people from far and near joined in having a community picnic in the park and great crowds of people came and had a great time.

ANIMALS, BIRDS, AND WILD FLOWERS.

This park has a small herd of deer, nine in number, which have increased from three fawns presented to the park by Oklahoma City in 1917.

They are very friendly and will eat from your hand and are very responsive to kindness and are a constant delight to many of the people coming to the park.

We also secured from Wichita Falls Game Reserve three fine buffalo specimens and from Yellowstone National Park we have two splendid elk.

There is ample food raised on the park to care for all these animals, and we feel that we are repaid many times when we see the pleasure evinced by the visiting public. The little red squirrels are also a great source of enjoyment to all, as they will come and eat from your hands and run away and hide the nuts for future use; they have as rivals the bluebirds, who are as tame and saucy as can be.

This park is full of birds; the mocking bird is with us all the year; the redbird, bluebird, wren, doves, robins, and many others make the air full of music. The quail are becoming plentiful again and seem to know that nothing will harm them in the park.

As for wild flowers, they are here in abundance and also in variety. I personally counted over 80 varieties between my office and town on one trip and there are many more to be found everywhere. Also many different kinds of grass growing in great profusion.

IMPROVEMENTS.

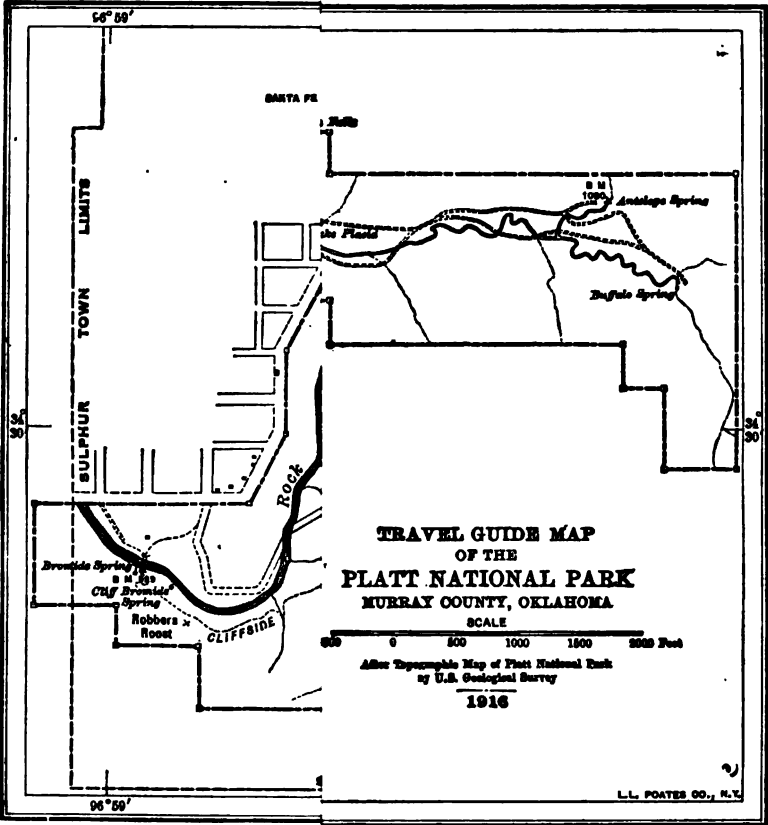
Owing to lack of funds allowed for this park I have not been able to do any great improvements, but must say that Platt National Park never looked so good to the public as it did this year, if we are to judge from what the visitors say.

We have brought in the elk and buffalo, built a fountain near Bromide Pavilion, made and cared for some 40 flower beds, moved a lot of unused cement walk and made it useful. Perfected an irrigating system from two flowing wells, the water from which was very kindly given us by the owners, and whereby we were able to irrigate and care for flowers and lawns.

We have opened up two new auto camp grounds, mowed weeds, repaired roads and fences, and raised enough feed and forage to care for all the park animals and teams, and this with \$1,500 less to spend than was appropriated last year.

RECOMMENDATIONS.

I recommend that Congress be asked to give us more funds with which to further develop the park and better maintain existing improvements.



SULLYS HILL NATIONAL PARK.

S. A. M. YOUNG, Acting Superintendent, Fort Totten, N. Dak.

GENERAL STATEMENT.

Sullys Hill Park has become increasingly popular as the people in the surrounding country have become more and more aware of its attractions. In a country none too inviting as to beauty of landscape, it affords a resting place with many elements of beauty. The woods, the lakes, and winding roads, not to speak of wild animals and historic and even prehistoric associations, afford a variety of interest. The automobile has made it possible for people from considerable distances to visit this park.

HOW TO REACH THE PARK.

The park is best reached from Devils Lake, a thriving town, distant about 15 miles. There are no hotels at the park, and it is best for visitors to drive out from Devils Lake with the plan of returning the same day. In fact, the attractions of the park may easily be seen in one day, the entire area being only about 800 acres.

INCREASED NUMBER OF VISITORS.

The visitors at the park during the present season have been, by months, as follows:

May-----	934
June-----	1,718
July-----	2,884
August-----	2,858
September-----	865
October-----	282
Total-----	9,841

It will be seen by comparison with previous reports that the attendance more than doubled in the past two years.

WILD ANIMALS.

The present number of wild animals in the park is 32 head of elk, 7 head of bison, and 6 head of whitetail deer. The animals all seem to be thriving, but the indications are that the park is now practically stocked to its limit.

IMPROVEMENTS.

During the present season the following improvements have been undertaken:

A water system to supply visitors with good water for drinking and for their automobiles has been installed. This consists of a catching basin, the water running from this to a combined storage tank and gravel filter and delivery being through a 1-inch pipe to the picnic grounds. Cost, approximately, \$275.

Two flag poles, 40 feet long, were shipped in from Idaho. These are of western fir. One was placed near headquarters and the other will be placed at the summit of Sullys Hill.

Ornamental gates, with supporting fence for an entrance, were purchased, but due to delay in freighting can not be erected the present season. These, with cobble-stone columns, will cost approximately \$1,400. Roads connecting with the new entrance have been prepared.

New parking grounds for automobiles have been cleared and cars have been admitted for the first time.

Telephone connection has been made with the Indian school line affording service with the surrounding country through Devils Lake. The cost was inconsiderable.

New tables have been provided for the accommodation of visitors at a cost of approximately \$125.

A new road for automobiles extending from the picnic grounds to the foot of Sullys Hill has been constructed, a distance of 1 mile, at a cost of approximately \$400.

Material for extending the fence so as to enlarge the picnic grounds is on hand ready for use next season.

A hostess house, with toilet facilities and a room for giving first aid in case of injuries or emergencies, is being erected. When completed and fully equipped it will cost approximately \$1,800.

RECOMMENDATIONS.

A road leading to Sullys Hill beach should be constructed or the present road improved, and inexpensive bathhouses should be erected so that visitors may have the pleasure of bathing. Two or three small boats should be provided for the use of visitors at Sweet Water Lake. A small outlay in this direction would add much to the attractiveness of the park.

MESA VERDE NATIONAL PARK.

THOMAS RICKNER, Superintendent, Mancos, Colo.

GENERAL STATEMENT.

By an act of Congress, June 29, 1906 (34 Stat., 616), Mesa Verde National Park was created, embracing an area of 66.2 square miles, or 42,376 acres, but by the act of Congress approved June 30, 1913, the boundaries of the park were so changed as to include an aggregate area of 76.51 square miles, or 48,966.4 acres. This park is situated in Montezuma County, the extreme southwestern county in the State of Colorado.

Mesa Verde is a large, irregular mesa or table-land, rising some 2,000 feet above the valleys on either side. When seen from a distance its top is smooth and flat, covered with verdure, hence the Spanish name Mesa Verde (green table). At its most northerly point this table-land juts out into a sharply defined butte overlooking the valleys on either side—Mancoas Valley to the east and the great Montezuma Valley to the west. This butte is called Point Lookout and is a landmark from all directions.

Though from afar the top of the mesa looks like a level plain, its surface is broken by many canyons, commencing in gentle, grassy valleys at the northern and western edge, growing deeper and more rugged as they descend, until they debouch into the Mancoas Canyon on the southeastern boundary of the park. In deep recesses in the walls of these canyons are found the ruins of the cliff dwellers.

ADMINISTRATION.

A superintendent, appointed by the Secretary of the Interior, with headquarters at Mancoas, Colo., the nearest railroad point, has custody of the park. He is assisted by a limited number of rangers, whose duties are to guide tourists through the ruins, patrol the park, and protect the game. No violations of the regulations or cases of vandalism have been reported during the past year.

TRAVEL.

Bad road conditions and lack of train service, due to washouts in the early part of the season, held back travel, and the tourists were very few until the latter part of June. With roads open to automobiles and the railroad operating regularly the travel rapidly increased, and the season will exceed all former ones in the number of visitors to the park.

Better automobile roads into this section are badly needed, and the Park-to-Park Highway, now under consideration, should fill this need and open up this section to general travel. Each year more camping parties come to the park, and with better roads and a choice of routes this section and Mesa Verde will draw an ever-increasing number of tourists.

FRANCHISES AND PERMITS.

One hotel-camp franchise has been granted, and under it ample accommodations for all tourists have been furnished.

Two permits for transporting passengers into and through the park have been granted. The Mesa Verde Transportation Co., with office at Mancoas, takes care of all visitors from this section and those coming in by rail. The company's automobiles meet all trains. The Merrick Tours Co., of Denver, has a permit to take tourists from Denver into and through the park. The Merrick Tours Co. is planning to establish an airship line from Denver to the park as soon as the equipment can be secured.

One permit has been issued for grazing cattle on the park lands remote from Spruce Tree Camp and the ruins.

Tourists visiting Mesa Verde National Park, season of 1920.

Means of transportation.	Passen- gers. carried.	Means of transportation.	Passen- gers carried.
By transportation companies.....	363	Horseback.....	10
By private cars.....	2,329	Pedestrians.....	5
By private cars (second trips).....	157		
By wagon.....	17	Total.....	2,500
By motor cycle.....	6		

Automobile travel by States, season of 1920.

Names of States.	Number of cars.	Number of passen- gers.	Names of States.	Number of cars.	Number of passen- gers.
Arizona.....	9	37	Nebraska.....	6	21
Arkansas.....	1	4	Nevada.....	1	6
California.....	9	32	New Jersey.....	1	4
Colorado.....	413	1,758	New Mexico.....	29	116
Idaho.....	2	13	New York.....	1	2
Illinois.....	7	29	Ohio.....	3	8
Iowa.....	6	25	Oklahoma.....	19	56
Kansas.....	15	34	Texas.....	14	45
Louisiana.....	1	4	Utah.....	9	38
Maryland.....	1	5	Washington.....	2	5
Massachusetts.....	1	3	Wyoming.....	4	10
Michigan.....	4	17			
Minnesota.....	1	5		570	2,329
Missouri.....	11	54			

SPRUCE TREE CAMP.

On the west rim of Spruce Canyon, overlooking the ruin Spruce Tree House, is located Spruce Tree Camp, the only hotel camp in the park. The camp consists of a permanent



building containing the dining and service rooms, rows of floored tents on terraces looking into the canyon, nicely furnished for bedrooms, a log cabin with rest room and museum, and a broad piazza from which one gets a fine view of the old ruin under the cliff across the canyon, and two rustic cottages also for use of tourists. A ranger's pretty cottage, a large automobile shed, and a stone water tower complete the group of buildings comprising Spruce Tree Camp. An electric-light plant in the rear of the camp furnishes the light, and a pumping plant under the cliff in the canyon forces the clear, cold water of Spruce Spring into the water tower, from whence it is piped to the camp. A bathhouse has been added this season to the conveniences of the camp. In the museum large glass cases hold the relics and afford the visitors a chance to examine and study them.

The work of the rangers as they have the time for finding and collecting relics and curios, is making the museum a very attractive part of the park.

RUINS.

Only a comparatively few of the many ruins in the park have been restored and made easily accessible to all. Of these Spruce Tree House, situated in a deep cave in the walls of Spruce Canyon and directly across from the camp, is a general favorite with all visitors. This ruin contained 114 rooms, 8 of these being kivas, or ceremonial rooms. It has been estimated that between 350 and 402 people inhabited this ruin. Its close proximity to Spruce Tree Camp and the easy trail leading to it make this one of the ruins that everyone explores. The trail winds down from the camp into the canyon near its head, passing under the overhanging cliffs beneath which sparkle the pure, cold water of Spruce Spring. As one takes a drink of this delicious water, and everyone does, one can not but think of the days of long ago and wonder. How many tired women filled their ollas here; how many maidens tripped along this old trail, happy and content; how many weary laborers from the fields above stopped here on their homeward way for a drink of cold water?

Did the children of those days play beneath this old cliff and skip rocks down the canyon? Did these boys and girls shout in wanton glee just to hear the hollow echo of their voices? Who can tell?

Cliff Palace, situated in Cliff Canyon, $2\frac{1}{2}$ miles from camp, is the largest ruin in the park. Balcony House, one-half mile beyond Cliff Palace, in Soda Canyon, is another of the best-known ruins. Here, too, one finds a spring of cold water in a deep recess of the cliff. Sun Temple, a ceremonial building on the top of the mesa, $2\frac{1}{2}$ miles from camp, is one of the most interesting ruins yet uncovered. In the walls of Fewkes Canyon, under Sun Temple, are Oaktree House and Painted House, or, as it has been more recently called New Fire Temple. New Fire Temple has been restored by Dr. Fewkes during the season, and instead of its being a dwelling place, as formerly supposed, it is found to be the fire house, where the fire was kept always burning, and from whence the fires in the homes could be renewed. This ruin has heretofore been of interest mainly on account of the paintings on the walls. Now, it takes on a new and more important significance and becomes one of the main points of interest—the place where the sacred fire was ever burning.

At the head of Fewkes Canyon a fine spring has been cleaned out, and it yields an abundance of clear, cold water to the thirsty tourist. The water sign used by these people of the long ago was found cut in the rock of the cliff, a sign by which anyone passing along the old trail would know that water was below. Square Tower House, 3 miles from camp, in Navajo Canyon, was restored during the summer of 1919, and the trail leading to it made safe for anyone. Far View House is another mesa pueblo near Mummy Lake, 6 miles from camp. These are the best-known ruins, and the ones visited by all, but to those who care to make more than a one or two days' stay in the park there are many more equally interesting, and each one different from all others. Spring House, 5 miles from camp, is reached by trail, and is a fine example of the architectural ability of this forgotten race. Near Spring House is the only natural bridge in the park.

In the Rock Spring section are many fine ruins, one of which nearly rivals Cliff Palace in size and interest. This section, it is hoped, will soon be opened to tourists by a trail from Spruce Tree Camp.

There are hundreds of ruins of all types in the park that have never been opened. Most of the ones under the cliffs have been visited, but there are many mounds covering ruins on the mesas that are yet untouched. The big group at Mummy Lake, of which Far View House is one, is evidently a collection of these big pueblos built in close proximity to each other, and at one time must have sheltered a large population. When these are all uncovered and restored they will be of wonderful interest, a city in itself.

CROP GROWING.

Again this season a crop of corn was planted on the mesa, and again it is proven that corn of fine quality and in abundance can be matured here. This is done without irrigation and proves the theory that this race of people were able to raise their own food-stuff, and that the remains of corn found in the ruins were raised here.

SCENERY.

For some unknown reason the large majority of tourists come to this park with the idea that it is a desert land, and that the journey is hard and uninteresting, over an arid, barren country, the ruins of the cliff dwellers the only point of interest. This erroneous idea prevents many from making the trip to Mesa Verde, but, as more people are coming in each year, this false view is being gradually corrected for after a visit to this park all visitors carry away memories of a wonderful and beautiful journey. The ride from Mancos to Spruce Tree Camp is one of the finest drives in a State noted for its scenic roads. The scenery is unsurpassed, and one is carried all too quickly through scenes as varied as they are beautiful.

The road into the park leaves the Mancos-Cortez Highway about 6 miles from Mancos. There are two roads ascending the mesa, the old road under Point Lookout on the Montezuma Valley side of the mesa, and the new road on the east or Mancos Valley side. These roads meet at Station 64 on the top of the mesa. The old road has heavier grades, but commands a wonderful view of the country to the west.

As the road winds around under the face of the cliff, one looks across the broad Montezuma Valley to the Blue Mountains in Utah, the Sierra La Salle, still more distant, and old Ute Peak in the middle distance. Looking backward one sees the snow-capped Rico Mountains and Lone Dome, not unlike an Egyptian pyramid on a mighty scale. From this vantage point one's gaze travels across space into four States, and the Four Corners can be seen, the only place where four States meet in one common point of boundary.

The new road takes one through forests of pinyon and juniper with open glades covered with the silvery sage brush. Winding about tree-covered knolls, it ascends the mesa by a zigzag way, sometimes through tree-covered spaces and again out into the open hillside. From this road one sees the grand old La Plata Mountains with Hesperus, "the farthest west," dominating all, snow-tipped and rugged, lifting its scarred head to a height of over 13,000 feet. Nestled at the foot of the range is the town of Mancos, looking, from this distance, like a group of tiny dots upon a broad expanse of green. After climbing the mesa and passing over the Saddle, this road joins the old road at Station 64 at the head of Morefield Canyon.

From Station 64, the road leads down beautiful Morefield Canyon, its floor a carpet of green and bounded on either side by a rocky ridge that rises higher as one goes down. Across the ridge dividing this valley from Prater Canyon the road passes in easy grades to the floor of Prater, another grassy valley of picturesque beauty. Up the west side of Prater the road ascends to the head of Moccasin Canyon, and here one looks off over the edge of the mesa and sees again the Montezuma Valley and the mountain ranges bounding it. From here the road winds along the northern edge of the mesa, heading one canyon after another until, passing between Soda and Navajo Canyons, it reaches the head of Chapin Mesa. From these higher levels one looks away to the southward for many miles to the Carliso and Luka Chukai Mountain ranges, soft and blue in the distance, barely distinguishable from the sky. In the middle distance Shiprock stands out alone, looking like some monster ship upon an ocean of blue.

Down the crest of Chapin Mesa the visitor is carried past Far View House and Mummy Lake to Spruce Tree Camp and dinner. No one can make this drive and not be filled with admiration and wonder. If this is desert, then a desert is a thing of beauty, and something well worth a long journey to see and feel.

ROADS.

Each year sees the roads in the park in better shape than formerly. As they are cared for, they are always being bettered, steep grades reduced, narrow places widened, and the curves straightened. They have been kept in excellent condition, though almost constant work has been required to do this, but the motorist appreciates the care given them, and this road has been pronounced by many to be one of the finest in the State. The two roads ascending the mesa give the tourist a choice of routes, and as each one opens up an entirely different set of views, most visitors ascend by one and descend by the other. The favorite route is to ascend by the old road and come down by the new, for in this way one is facing the scenic attractions both ways. The old road is still controlled by telephone, and no cars are allowed to meet on that hill. The roads from Spruce Tree Camp to the different ruins have been kept in good condition, and a new piece of road has been made from near Sun Temple to Inspiration Point, giving the tourist one of the grandest views in the park without leaving his car.

TRAILS.

The trails in the park have been kept in repair by the work of the rangers, and one new trail has been made from near Cliff Palace to Community House in Cliff Canyon. Another one has been located and cleared around the southern end of Chapin Mesa, by way of Navajo, Soda, and Cliff Canyons, to Inspiration Point. Still another one is now being located from Spruce Tree Camp to the Rock Springs section.

WILD ANIMALS.

The deer are the most important of the wild life in the park, and the few herds that live here do not increase as they should on account of the heavy toll taken each year by the mountain lions. These predatory animals live among the cliffs at the edge of the mesa, and, as their young are old enough to travel, they roam the portions of the park frequented by the deer. Only a few of these mountain lions have been seen this season, but evidences of their killings have been encountered. Coyotes are plenty, and small game in great numbers is seen in all parts of the park.

RECOMMENDATIONS.

Road and trail construction and restoration of ruins are the most pressing needs of this park. The roads now in the park are only a beginning of what are needed. A large percentage of the motor travel either comes in or goes away from the park by way of Shiprock, N. Mex., on the way to or from the Pacific coast, and in order to do this they have to go a roundabout way. A road from Spruce Tree Camp south to the Cortez-Shiprock Highway will lessen the distance some 70 or 80 miles. With such a road a visit to Mesa Verde would no longer be a detour, necessitating many miles of backtracking, but would place the park on the direct line of travel. In fact, the nearest route from here to the coast would lead across Mesa Verde its entire length.

Other roads are needed to open to tourists the different sections of the park, each section having an interest of its own, but the road to the south should be made at once, as the need for it is constantly growing as travel increases.

A good trail to Rock Spring would open that interesting section to horseback parties and hikers, and even after a road is constructed to accommodate the motorist, the trail would be used by many who enjoy a horseback trip.

Another trail to the east rim of Soda Canyon and the Twin Towers, a portion of the park now almost inaccessible, would be a favorite jaunt for those who like the horseback trips.

The group of ruins near Mummy Lake should be uncovered, and when these are all restored they will comprise a city of considerable size, a city that at one time must have

sheltered a large population. Spring House, in Long Canyon, should receive attention and the many ruins near Rock Spring. In fact, there is an almost endless amount of work to be done, and to make any progress on this gigantic undertaking a generous appropriation should be made each year in order that a season's work will show the restoration, not of one ruin, but of several. With ample funds and, consequently, a larger force of workmen, a big showing can be made each season, and a world of new interest added to the present attractions.

Another feature, and a wonderfully attractive one, can be added to the park by doing some necessary fencing and making a big game preserve. The location and climate make this park an ideal place for game, and buffalo, elk, deer, and mountain sheep would thrive here, as there are both summer and winter ranges ample for a large herd of these animals.

GLACIER NATIONAL PARK.

GEORGE E. GOODWIN, Acting Superintendent, Belton, Mont.

GENERAL STATEMENT.

The Glacier National Park was created by an act of Congress approved May 11, 1910 (36 Stat., 354), and consists of an area of approximately 981,681 acres, or 1,584 square miles, all of which is situate in northwestern Montana. It embraces the extreme northern part of the Rocky Mountain Range in the United States, and is contained in the area situated between the international boundary on the north and the Great Northern Railway on the south, the west line of the Blackfeet Indian Reservation on the east and the North Fork of the Flathead River on the west. Its maximum dimension occurs along the crest of the Rockies and is approximately 66 miles in a northwesterly-southeasterly direction, and its maximum east and west width of 40 miles occurs at the international boundary line. Within its boundaries is found the most bold and rugged mountain scenery of an Alpine nature in the United States. The abruptness and striking configuration of the peaks is due, principally, to the geological action known as the Lewis overthrust, in which foliation of the earth's crust occurred, and the western portion of this area was raised up and shoved over the eastern portion, and the resulting action of this overthrust, and of the erosion which has occurred in the countless years since that time, have carved out for the present inspiration and study of men a large number of pinnacle peaks, sharp-edged escarpments and precipitous cirques which, with the 200 or more beautiful Alpine lakes that are situated in the park, the countless waterfalls and cataracts, and the 60 glaciers, give to Glacier National Park an individuality, and at the same time an alluring beauty and impressiveness, that is surpassed in but very few, if any, mountain regions in the world.

GEOGRAPHY.

Glacier Park has an especial geographical interest in that within its bounds occurs the intersection of the North and South Divide of the continent with the East and West Divide. It may properly be called the dome of the continent, for at the intersection of these divides occurs Triple Divide Mountain, an especially interesting peak because at its summit one may stand and look on waters that flow north into Hudson Bay, on waters that flow east and south to the Gulf of Mexico, and those that flow west into the Pacific Ocean.

ROCKS.

Geologically it is both interesting and instructive, for the rocks exposed in the overthrust, or eastern slope, portray to the geologist much of the early geological history of this section of the earth. Most of the rock exposed in the overthrust is known as the Algonquin strata, and was probably laid down as sedimentary rock many million years ago. There is probably more of this Algonquin strata exposed in Glacier Park than in any other part of North America. It is said that the only other place in the United States where similar aged rock can be seen is in the Grand Canyon of the Colorado, which, one tourist this summer said, was "Glacier Park turned upside down."

FLOWERS.

Because of the many overshadowing, or predominating features of Glacier Park its flowers are seldom spoken of, but to the real lover of the beautiful outdoors its many glacial meadows, valleys, and hillsides, which are literally carpeted with Alpine and other wild flowers of a great many varieties and colors, and which add a distinctive charm and beauty to the park, afford an opportunity for the study and classification of these flowers that is unsurpassed.

PARK ADMINISTRATION.

The park is administered by a superintendent in general charge, a ranger force of some 12 to 15 permanent rangers, a chief ranger and two assistant chief rangers. The superintendent's office and park headquarters, from which the general office work is conducted, are situated at Belton, the western entrance to the park. At Glacier Park Station, the eastern entrance to the park, the chief ranger is located and there is a storehouse and other necessary buildings. Ranger stations, in which the permanent rangers live, are located at different points in the park, and especially along, or near, the boundaries of the park, in order that the park may be properly patrolled. A telephone system connects most of the ranger stations in western and southern portions of the park. This is operated by the park service, and there is also a telephone system connecting the hotels and chalets on the eastern side of the park.

TOURIST ACCOMMODATIONS AND FACILITIES.

The hotel system of the park consists of two large and thoroughly modern hotels, one at Glacier Park and one at Many Glacier, and seven chalets, one of which is

located at Belton, the western entrance, and the others at different points in the park, all operated by the Glacier Park Hotel Co., and another first-class tourist hotel, and several cottages run in connection with it, called Glacier Hotel, situated near the head of Lake McDonald on the west side of the park, which is operated by Mr. John E. Lewis. And in addition to these hotels and chalets there are housekeeping cottages that can be secured at Apgar settlement, at the foot of Lake McDonald; also at Geduhn's settlement, at the head of Lake McDonald.

All of the outlying hotels are connected with the railroad by means of bus or boats operated on regular schedules, as are some of the chalets, while the outlying chalets are reached by saddle horses, of which there are over 500 used for the purpose of tourist transportation during the busy portions of each year. Thus this park is especially fortunate in having a hotel system second to none and coordinated transportation that offers to the tourist interesting and, at the same time, convenient methods of access to nearly all portions of the park.

Glacier Park also occupies a unique position among national parks in that it is now, and for a long time will be, essentially a saddle-horse park; that is, in order for the tourist to see the park to the best advantage he will have to leave the roads and travel by horseback or by foot, and because of the very rugged nature of its topography it will always offer to the biker and horseback traveler large areas of wild mountain country very remote from roads or railroad. Because Glacier Park is best seen from horseback and foot trails, there has developed a demand for saddle horses that exceeds that of any other park, there being utilized in Glacier Park this season more saddle horses than were used for tourist travel in all of our other national parks.

TRAVEL.

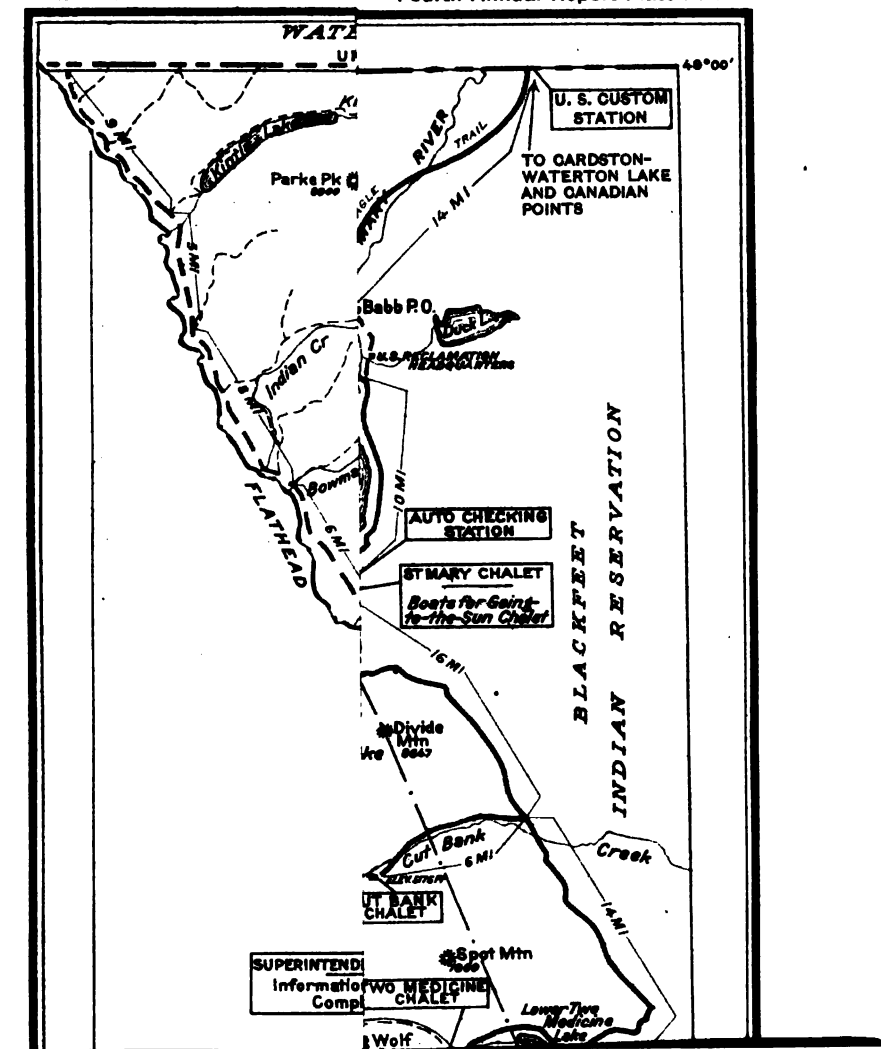
The tourist travel this year has exceeded that of last year by about 18.4 per cent, it being the largest travel that the park has ever experienced. During the travel period, that is, from June 15 to October 1, there were 22,449 visitors, and, in all probability, there were three or four hundred visitors of whom we have no record, they having entered the park at outlying points where no register of visitors has been maintained. The total number of private automobiles that entered the park, for the same period, of which we have a record is 2,000. This is an increase of 312 over last year.

While as compared with some of our other national parks, the above travel figures are small, recognition must be given to the fact that many of these visitors were people who came to this park and spent anywhere from two weeks to two months or more. Hence, the number of tourist days in this park might compare quite favorably with some of the other parks having a larger registration consisting principally of local people that entered to spend the day, or for the week end only. Another peculiar feature of Glacier Park is that a large part of the travel comes from a distance, and are what might be termed "real tourists," in that they come here as a part of a trip in touring the country, or come from distant sections of this country to visit this park.

Very little increase in the private automobile travel can be expected until such time as an east and west road is constructed through the park, which will form the missing link in the present park-to-park highway. Until that time Glacier Park will have to depend for its growth in travel upon its increasing popularity, which is strikingly illustrated by the increasing number of visitors who come back year after year for long stays, oftentimes coming from great distances. During the past season there were a number of specially conducted tourist parties brought into the park, among which were the Massachusetts Forestry Association party, two parties conducted by the American Express Travel Bureau, and parties conducted by the Frank Travel Bureau, by Raymond & Whitcomb, and other travel bureaus, also several large special train parties of Shriners (11 trains), and other organizations. There were a number of distinguished visitors to the park, including the Vice President of the United States, the Appropriation Committee of the House of Representatives, several other Congressmen and United States Senators, the Park-to-Park Highway party, the Director of National Park Service, the Director of the Reclamation Service, the Commissioner of Indian Affairs, and many other men of high standing in scientific, military, educational, literary, business, and political circles.

The following travel statistics are given, showing the method and amount of tourist travel at the different entrances:

Registration at Belton entrance:	
Via Glacier Park Transportation Co.....	3, 862
Via Park Saddle Horse Co.....	7
Via private conveyance, auto.....	4, 343
Via private conveyance, horse drawn.....	58
Via private saddle horse.....	31
Via mail stages.....	33
Entered on foot.....	338
	8, 672
St. Mary's entrance:	
Via Glacier Park Transportation Co.....	6, 129
Via Park Saddle Horse Co.....	164
Via private conveyance, auto.....	2, 525
Entered on foot.....	32
	8, 850
Two Medicine entrance:	
Via Glacier Park Transportation Co.....	2, 079
Via private conveyance, auto.....	963
Entered on foot.....	72
	3, 114
Many Glacier entrance, via private conveyance, auto.....	289
Waterton Park entrance, via boat from Waterton Lakes Park, Canada.....	1, 488
Cut Bank entrance, via Glacier Park Transportation Co.....	36
Total visitors entering the park.....	22, 449



demanded or within a very short time be provided with saddle and pack animals for the various trail and camping trips.

The camping trips this season were more popular than ever before, due, in part, to the Belly River section being more accessible because of the new Many Glacier-Belly River

Total visitors entering the park-----

Automobile permits issued:

Belton entrance.....	972
St. Marys entrance.....	708
Two Medicine entrance.....	229
Many Glacier entrance.....	79
Complimentary.....	1,988
	21

Total..... 2,009

Stop-overs at Glacier Park Hotel, not making automobile or saddle horse trips therefrom, 285.

The division of the above visitors by States and foreign countries is indicated below:

STATE.	St. Mary's entrance.	Belton entrance.	STATE—continued.	St. Mary's entrance.	Belton entrance.
Alabama.....	9	1	Oklahoma.....	42	44
Arizona.....	5	8	Pennsylvania.....	345	91
Arkansas.....	14	8	Rhode Island.....	23	7
California.....	420	299	South Carolina.....	.....	1
Colorado.....	75	61	South Dakota.....	26	44
Connecticut.....	100	23	Tennessee.....	15	12
Delaware.....	10	.....	Texas.....	83	60
District of Columbia.....	74	35	Utah.....	30	31
Florida.....	251	.....	Vermont.....	1	.....
Georgia.....	46	7	Virginia.....	.....	12
Idaho.....	863	102	Wyoming.....	38	33
Illinois.....	126	324	West Virginia.....	50	5
Indiana.....	236	60	Washington.....	262	494
Iowa.....	107	150	Wisconsin.....	190	95
Kansas.....	23	65	Hawaiian Islands.....	1	2
Kentucky.....	12	13	Total.....	8,613	8,643
Louisiana.....	6	1			
Maine.....	16	5	COUNTRIES.		
Maryland.....	198	11	Canada.....	218	22
Massachusetts.....	132	64	China.....	2	.....
Michigan.....	735	408	England.....	3	4
Minnesota.....	7	3	France.....	3	1
Mississippi.....	264	157	Holland.....	1	.....
Missouri.....	2,029	5,069	Philippine Islands.....	3	.....
Montana.....	142	71	Ireland.....	1	.....
Nebraska.....	118	39	Italy.....	6	.....
Nevada.....	7	1	Guatemala.....	.....	1
New Mexico.....	.....	6	Switzerland.....	.....	1
New Hampshire.....	6	1	Total.....	237	29
New York.....	673	205	Grand total.....	8,850	8,672
North Carolina.....	186	1			
North Dakota.....	134	268			
Ohio.....	298	125			
Oregon.....	111	70			

No record of visitors by States at other entrances.

ACCIDENTS.

No fatalities occurred during the season among the visitors to the park. There were several minor and two or three quite serious accidents, these generally consisting of tourists falling off horses or falling and spraining or dislocating their limbs. The fact that there were not more accidents and no fatalities bespeaks much for the manner in which the visitors were handled by the transportation and saddle-horse concessioners.

PUBLIC UTILITIES.

The hotels and chalets of the park, with the exception of the Granite Park Chalet and Sperry Chalet, were opened at the beginning of the tourist season, June 15. Sperry and Granite Park Chalets, however, because of the snow condition and the difficulty experienced in opening the trail to the chalets for horse travel, were not opened until about the 7th or 8th of July. As stated these hotels and chalets are operated by the Glacier Park Hotel Co., and by Mr. John E. Lewis, and the class of service and accommodations rendered in the various hotels were the cause of considerable favorable comment on the part of guests of the park.

Although tourist travel was the heaviest the park has ever experienced, no real difficulty was experienced at any time during the season because of the lack of saddle horses to provide the desired saddle-horse service to the tourists in the park. This is a statement reflecting no little credit on the Park Saddle Horse Co., who furnished the horses and equipment, at least when we consider that they had in operation over 550 saddle horses operating out of the various hotels and chalets and in such a way that tourists who entered the park at any of the entrances or those stopping at any of the hotels could on demand or within a very short time be provided with saddle and pack animals for the various trail and camping trips.

The camping trips this season were more popular than ever before, due, in part, to the Belly River section being more accessible because of the new Many Glacier-Belly River

trail, and when the trail is constructed from Belly River across Indian Pass (as it will be next year) it is anticipated that the camping parties to the northern section of the park will greatly increase. All of the horses furnished tourists for trail and regular camping parties were provided by the Park Saddle Horse Co.

The auto bus transportation of passengers on the east side of the park between the Glacier Park entrance and Many Glacier Hotel and the various chalets and between Belton and the foot of Lake McDonald was furnished by the Glacier Park Transportation Co., who are also the public operators of the automobile service in Rocky Mountain National Park, and although at times when there were large parties visiting the park their equipment was worked to the extreme limit they were able to successfully handle the season's travel.

The boats on Lake McDonald were operated by Frank Kelly, as in previous years, and afforded transportation to the park visitors that traveled on Lake McDonald. A small launch carrying parties from Waterton Lake Park to the head of the lake in Glacier Park was operated during the season by Mr. H. H. Hanson, as was a similar launch operated by Roxford & Jacobus. This summer a launch of about 40-passenger capacity was built and installed in Middle Two Medicine Lake at the Two Medicine Chalets and operated under the franchise of the Glacier Park Hotel Co., as was the launch *St. Marys*, which was operated between St. Marys Chalet and Going-to-the-Sun Chalet on Upper St. Marys Lake. In addition to these two launches the Glacier Park Hotel Co. also furnished for hire to the park visitors on Two Medicine Lake, St. Marys and Lake McDermott rowboats and Evenrudes, and rowboats, etc., were also rented park visitors at Glacier Hotel on Lake McDonald.

REVENUES.

The revenues collected and transmitted to the service during the fiscal year ending June 30, 1920, together with the principal sources, are as follows:

Automobile permits-----	\$2,365.50
Transportation franchises-----	3,323.41
Telephone rental-----	232.00
Grazing and hay cutting permits-----	273.00
Timber sales-----	151.43
Miscellaneous receipts-----	495.68
Total-----	6,841.02

The revenues of this park are, of course, bound to be small as compared with the revenues of some of the parks, as the limited amount of road mileage and the fact that there is no transmountain road keeps the number and price of automobile permits down very low.

WEATHER.

The summer of 1920 would be considered locally a dry and hot summer in that there was but very little rain or cool weather between the 1st of July and the last of August, and as a consequence roads and trails became very dry and dusty indeed, and bad fire conditions developed in the forests which, coupled with the fact that there were three very severe electrical storms, caused an unprecedented number of forest fires to be started by lightning. With the last of August, however, the weather changed and a number of rainy days eliminated the fire risk and restored the roads and forests to their normal condition.

The average maximum temperature for June was 71.92° the minimum 36.16°, the mean 54.14°, and the precipitation 0.7 inch; that of July, 90.2-47.0-68.6° and 1.57 inches, and that of August, 81-43-62.05° and 2.05 inches, respectively.

ROADS.

During the past season the roads of the park, of which there are in all about 130 miles, 70 miles being situated on the east side and lying partly within the Blackfeet Reservation and 60 miles on the west side of the park, wholly within the park boundaries, were, for the greater part, worked over and kept in as good condition of repair as the funds allotted for this purpose would permit.

BLACKFEET HIGHWAY.

The Glacier Park-Many Glacier Road, or Blackfeet Highway, as it is called, extending from Glacier Park Station entrance to Many Glacier Hotel, a distance of 55 miles, was for about 2 miles, between the fourteenth and seventeenth mileposts, improved by widening, regrading, and graveling, and about 3 miles of this road was also improved by widening, regrading, and graveling between the thirty-eighth and forty-first mileposts. This improvement work eliminated two bad stretches of road and leaves perhaps 10 miles of additional road which should be graveled in the near future and many short sections throughout almost the entire length of the highway which should be improved by widening, ditching, and the elimination of sharp curves. Many of the cross-drainage structures, including both culverts and bridges, have reached the point where they will have to be renewed within the next year or two, and it is hoped that funds will be available for the installation of permanent structures. A number of small wooden culverts, which were badly rotted, were replaced this year by galvanized-iron culverts, most of these being between the fiftieth and fifty-fifth mileposts.

Certain other minor repairs were made to the road, including graveling in the vicinity of Many Glacier Hotel, and it is expected this fall to work a small crew regrading and possibly graveling a portion of the road between Two Medicine River and Glacier Park entrance, and estimates have been included for sufficient funds to improve by widening, graveling, and regrading about one-half of the remaining unsatisfactory sections.

TWO MEDICINE ROAD.

Very little work was done on the Two Medicine Road other than the repairing of a few temporary bridges and keeping the coarse gravel and large rocks raked out and the ditches open and other work of a maintenance nature.

During the past summer a survey has been made for a new road which will be above the flowage area of the Two Medicine Reservoir as now constructed. This will require a road about 4 miles in length, which is estimated to cost \$6,000 per mile. It will be necessary to build this road before the Reclamation Service can utilize the storage of the Two Medicine Reservoir, the dam of which has been completed several years. Accordingly, an item covering the cost of this new road has been included in the estimate for next year.

CUT BANK ROAD.

A little maintenance work was done on this road in the early part of spring, but because of the light travel no extensive repairs or maintenance work was considered necessary.

BELTON-FISH CREEK ROAD.

This road was regraded in certain sections, the ditches opened up, and other like maintenance work done.

NORTH FORK ROAD.

About the middle of August a crew was started on this road repairing the corduroys, which had been badly broken up by heavy automobile trucks, and making certain other necessary repairs. The road, however, is still in very bad shape. It is practically impossible for automobiles to get over it and it is difficult even for team travel. It is hoped that most of the corduroys can be repaired this fall, but because of the lack of maintenance work on this road for the last two years and the increase of travel on it, extensive repairs are now necessary to put it in even passable condition.

Next year it is hoped that sufficient funds will be available for repairing the North Fork Road throughout its entire length and making it suitable for automobile travel during the dry weather, so that tourists entering the park on the west side may have opportunity to visit the Bowman and Kintla Lake sections.

BELTON BRIDGE.

The old wooden bridge across the Middle Fork of the Flathead River, at the Belton entrance, has for several years been in bad shape and for the last three years has been considered unsafe for heavy automobile travel. This summer one of the principal members of the bridge failed and emergency repairs were necessary in order to keep this bridge open to light traffic during the rest of the tourist season, and because of its weakened condition all heavy truck and team travel over the bridge was stopped, and it was deemed advisable for passengers who traveled on the regular 16-passenger busses to dismount and walk across the bridge.

There is under construction a concrete, earth-filled, spandrel arch bridge. This work is being done under contract with this service by F. H. McClung, of Spokane, and at the present writing the concrete arch has been poured and concrete is being placed in the wing walls, and in all probability the bridge will be completed by November 1. This bridge, which occupies a natural bridge site about 70 feet east of the old bridge, where the span between the solid ledge is about 100 feet, will be of architecturally pleasing outlines and, at the same time, a substantial and permanent structure that has been needed for a long time.

TRAILS.

Of the 350 miles or more of trails in the park about 225 miles are regularly used by tourists, and these were maintained in a satisfactory state of repair throughout the season. The heavy snowfall of last winter and late spring made it necessary to do more or less shoveling in order to open up the tourist circuit trails in the passes and at the higher levels, and because of the snow conditions but little was done on the higher trails until the 1st of July. All trails, however, were open by the 6th of July and in use for tourist travel.

During the past summer some work was done on the improvement of the Many Glacier-Belly River trail by way of Red Gap, which was partly cut out and graded last year. About 5 miles of new trail was built on the south end this year, and betterment work done on other places. Some work was also done on the Indian Pass Trail, which is a proposed trail between the head of Glens Lake and the head of the Waterton Valley. Between 2 and 3 miles of this trail was cut out on the east end and a similar distance on the west end. The bad weather and early snows caused the work to be stopped on the Waterton Lake side, although at the present writing it is still in progress with a small crew on the Belly River side. In all probability this trail can be opened up early next season, so that it can be used during the months of August and September for tourist travel.

Next year it is also expected to complete a trail from the head of Waterton Lake through to the head of Kintla Lake by way of Browns Pass and Hole-in-the-Wall Falls. With the completion of this trail it will be possible for tourists to visit the points of interest in the most northern portions of the park without having to use any of the trails that are situated north of the international boundary line, something that is at present impossible.

It is also planned during the coming season to construct certain foot trails to the summits of the peaks near Glacier Hotel, Many Glacier Hotel, and Going-to-the-Sun Chalet, and to construct boundary patrol trails for rangers on border patrol and fire lanes and trails for fire-protection purposes.

BUILDINGS.

Allotments were made this year for the construction of a garage and stable building and sheds on the administrative site near Glacier Park Station, but the funds were required for fire fighting, and these allotments were canceled, and it is doubtful if it will be possible to erect these buildings this year.

The old storehouse building at former administration headquarters at Fish Creek has been torn down and moved to the new administration headquarters, where it has been erected as a temporary blacksmith and carpenter shop. Likewise, the old wagon sheds at Fish Creek have been torn down and are being erected for temporary use at administration headquarters. No other work on buildings, other than the necessary maintenance and repair work, has been done. It is hoped that next year funds will be available for the eight small buildings, including four ranger stations, which are included in the estimate for 1922. The administration building at Glacier Park Station, together with the other utility buildings, are urgently required for the administration and protection of the park, and especially a residence for the chief ranger, who for years has been obliged to provide his own house at Glacier Park Station. We do not have sufficient ranger stations, and two ranger stations which were burned by the forest fires last year have never been replaced.

FISH.

The fishing has been very good in most parts of the park throughout the season. It has been especially good at McDermott Lake and some of the other streams, including Two Medicine, which have been heavily stocked, and with the increase in the number of trout fry that have been planted during the past season and the season before the fishing next year should be exceptionally good. The fish hatchery situated at Glacier Park Station was in operation throughout the season, during which time about 1,058,000 trout fry were planted in the waters of the park, a so about 415,000 mountain grayling. The trout were of the Eastern Brook, Rainbow, or black spotted variety. The operation of the hatchery has been successful, and the fact that the fishing in the park is improving, due to stocking, shows that the hatchery is filling a want that existed before it was established.

During the season a limited number of white fish were taken from the waters of Upper St. Marys Lake by nets and used by the hotel company as a part of their fish food. These white fish were of a very good variety and constituted one of the most enjoyed entrees of the hotel menu.

WILD ANIMALS.

The severity of the past winter and the heavy and late snows of the spring, which wrought such havoc on all stock in this section of the United States, also caused much suffering and a heavy loss among the wild animals of this region, and especially those that frequent the higher altitudes of the park. The exact loss that occurred among the elk, deer, and, possibly, moose can not be accurately estimated, but it is doubtful if the number of wild animals this year, even with the natural increase, equals the number that were in the park last year.

Of the different species of game in the park one can not even furnish an approximate estimate. It is probable, however, that Glacier Park has within its bounds more Rocky Mountain goat and Big Horn sheep than are found in any other similar area in the United States. Many goat and sheep are seen by the travelers on the higher park trails. Deer and elk are quite plentiful in some sections, and around the Belton entrance to the park the deer are very tame. The moose are so wild that they are seldom seen, although from the signs it is probable that there are quite a large number in the northwestern and northern portions of the park. The elk, of which there may be perhaps 200 or more in the park, are not materially increasing in numbers and never will until they are protected on the Blackfeet Indian Reservation and in the forests to the south of the park, as the hard winters and heavy snows of the park drive them outside of the park boundaries, where they are killed by white hunters and Indians. There are a large number of grizzly and brown bear, as is evidenced from bear signs one sees everywhere, but the bears are so wild they are seldom seen by the tourist and give but little trouble to the hotels or camps.

FOREST FIRES.

The very dry weather which occurred between the 1st of July and the middle of August brought about conditions very favorable for forest fires, and as a result of the severe electrical storms that occurred on the evening of July 20, the afternoon and evening of July 21, and the evening of July 29 a large number of forest fires were started in widely removed and remote sections on the west side of the park. Some of these fires burned themselves out before we could get to them. There were, however, 20 fires or more in the park upon which more or less work was done in order to keep them under control and prevent their spreading. Fortunately, only three of these fires burned large areas—that on Dutch Creek, where perhaps 1,500 to 2,000 acres of sparse timber were burned, some of which had been burned a few years previous; that on Little St. Marys Creek, where perhaps 150 to 200 acres of quite good timber were burned; and that on Huckleberry Mountain, where perhaps 200 or 300 acres of poor timber were burned. There were also perhaps 40 acres of good timber burned on the south end of Appar Mountain and perhaps 150 acres of poor timber on the headwaters of Mineral Creek. None of these areas are near roads or trails and the fire scars will not be seen by the park tourists. The other fires were from 1 acre to 30 or 40 acres in extent, and did but little damage.

The fires this season were, as they always are, a serious handicap to the maintenance and construction work, as it required practically our entire maintenance and construction force to combat the fires and prevent their spreading. And, in addition to the regular force of employees that were engaged on this work, it was necessary to ship in men from Great Falls, paying their fare to the park and return. Taking our construction and maintenance force from the work upon which they were employed resulted in our being unable to complete many of the much-needed improvements.

WATER SUPPLY FOR PARK HEADQUARTERS.

There has been included in the estimate this year an item for water supply and electric-lighting system for park administration headquarters at the Belton entrance. The administration site is so located that a gravity water supply is not available, and thus far it has been necessary to pump water with a small temporary plant from the Flathead River. This is an unsatisfactory water supply and possibly an insanitary one, and to eliminate this a deep well should be put down and an adequate pumping plant installed and at the same time an electric-lighting system put in which could be run from the motor that runs the pump.

TELEPHONE LINES.

This park has in operation approximately 100 miles of single-wire, ground-return, telephone lines, for the most part stretched through the woods and attached to the trees, and because of its cheap construction and the difficulty in maintaining it in good condition, it gives very unsatisfactory service. There is no telephone communication between the east and west side of the park, which is a great handicap in the administration and protection of the park. Items have been included in the estimate for the fiscal year 1922 for the construction of a wire telephone circuit between Belton and Glacier Park and the construction of about 50 miles of additional lines to connect outlying ranger stations, and it is hoped that the funds for this will be made available.

RECOMMENDATIONS.

Glacier Park needs much in the way of improvements in order that the administration and maintenance work may be economically and satisfactorily conducted. Among the various needs of the park the following are, in my opinion, the most urgent:

A transmountain road should be constructed between the west and east sides of the park by way of Lake McDonald, Logan Pass, and St. Marys Lake. The first link, or from the foot of Lake McDonald to the head of Lake McDonald, should be completed next year in order that visitors who enter at the western entrance in their own automobiles can travel through to Glacier Hotel.

A telephone line connecting the eastern and western part of the park, and all ranger stations, is an absolute necessity to good administration. This line has been estimated for heretofore, and it is hoped that funds will be appropriated for its construction next season.

Funds should be provided for the construction of the Two Medicine Road in order that the Reclamation Service may utilize the storage of the Lower Two Medicine Lake Reservoir.

An adequate water and lighting system should be provided for administration headquarters.

The road system on the east side of the park should be improved throughout, and the narrow and crooked sections of the Blackfeet Highway should be regraded and graveled and about 10 miles of additional graveling should be done on sections of the road.

The North Fork Road should be improved throughout its entire length.

The Indian Pass Trail should be completed and the Browns Pass Kintla Lake Trail should be constructed next year.

The 52 miles of boundary patrol trails estimated for should be built in order that the rangers can properly patrol the boundaries of the park, and the 33 miles of fire patrol trails for the protection of the forests on the west side of the park should be constructed, as should the footpaths to the tops of the mountains in the vicinity of Many Glacier Hotel, Glacier Hotel, and Going-to-the-Sun Chalet.

A small dam between Josephine Lake and Lake McDermott should be built in order that both lakes may be available for boating by guests of Many Glacier Hotel.

The administration building at Glacier Park Station and the ranger stations, for which funds have been requested in the present estimate, should be built, as these are all badly needed for the proper administration and protection of the park.

The ranger force in the park should be reorganized somewhat and suitable recognition given for especially meritorious service, and additional temporary rangers should be provided during the hunting and fire seasons.

Some means should be devised whereby it would be possible for the park service to have police administration of the section of the Blackfeet Highway situated on the Blackfeet Indian Reservation, between Glacier Park Station and Many Glacier Hotel, in order that we may exercise proper police powers with respect to violators of the automobile regulations, and unless this is made possible serious accidents are bound to occur, because, as the road is improved, automobilists travel faster, and consequently increase the chances of serious accidents.

The regulations pertaining to this park should be changed somewhat, so that better protection can be given the concessioners operating in the park from the unfair competition of irresponsible parties that attempt to conduct similar service.

It is also believed that the National Park Service should maintain an information and routing office for the convenience of visitors at each entrance in order that the tourists that visit the park and do not know exactly where they want to go or what they want to see, or the time required to visit certain sections or make certain trips, could secure this information.

Arrangements should be made so that park rangers incurring expenses in taking prisoners to and from the point of trial can be promptly reimbursed for all necessary expenses, and at least two rangers should be given special appointments as deputy United States marshals in order that they may make arrests or hold prisoners outside of the park boundaries.

CONCLUSION.

In concluding this report of what has been, perhaps, the most successful season in the history of the park, from the tourist's point of view at least, it would not be fair to omit mention of the assistance that this office has received from the various concessioners operating in the park and Mr. John E. Lewis, who operates the Glacier Hotel, and the fact that the season has been such a successful one is due in a large part to the

cooperation and assistance rendered by the public operators in all matters affecting the handling of the park visitors. Grateful acknowledgment is made to my assistants, the clerks, and rangers for the long hours of service, which were rendered cheerfully and well, in order that the increased work of summer might be kept up, that the fires might be kept from spreading, and that the visitors of the park might enjoy their visit and take away with them only pleasant memories of an outing well spent.

ROCKY MOUNTAIN NATIONAL PARK.

L. CLAUDE WAY, Superintendent, Estes Park, Colo.

GENERAL STATEMENT.

The Rocky Mountain National Park was created by the act of January 26, 1915 (38 Stat., 798). Under the act approved February 14, 1917 (39 Stat., 916), entitled "An act to add certain lands to the Rocky Mountain National Park, Colorado, approximately 43 square miles have been added, making the present area of the park approximately 400 square miles. The first act provided that not more than \$10,000 should be expended for maintenance, supervision, or improvement in any one year, unless first expressly authorized by law. By the act of Congress approved March 1, 1919, the inhibition was removed. Exclusive jurisdiction to the above area has not yet been ceded to the Federal Government by the State of Colorado.

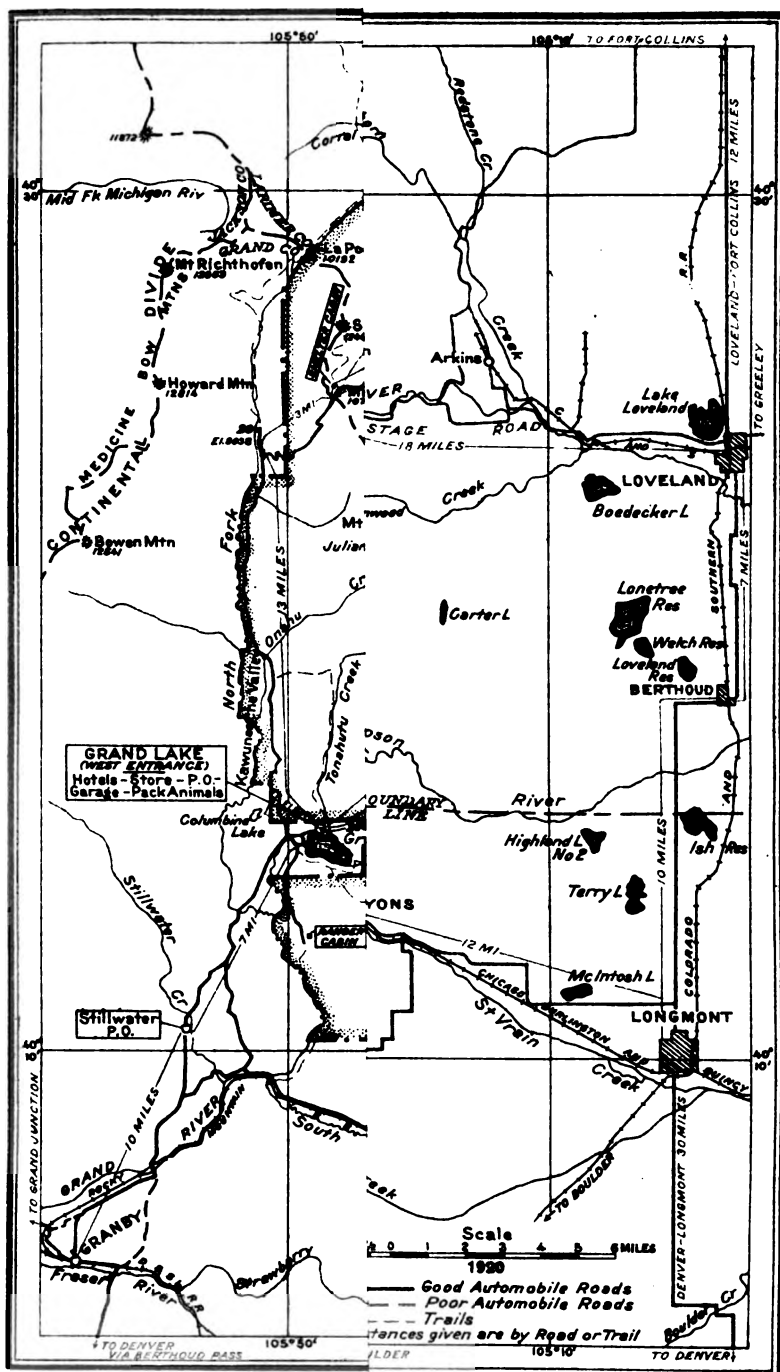
TRAVEL.

The weather this summer has been such as to discourage travel. Almost daily rains during July and August resulted in exceptionally cool weather, and travelers claimed that in many sections of the country this same condition prevailed, and that many people did not feel the need of seeking higher altitudes to get away from excessive heat. In spite of this fact, however, our attendance over last year shows an increase of 48 per cent.

Due to the increased capacity of the following hotels, we did not experience the same difficulties from lack of accommodations which we experienced last year. The Lewiston Hotel increased its capacity by 70 guests; the Lewiston Chalets, 65; the Crags, 190. A new hotel under our supervision was erected at Grand Lake with a capacity of 160 guests. This hotel was opened on June 15. Mr. H. M. Harbison put in rooms at Grand Lake to accommodate 24 guests. A new hotel, the National Park, was also constructed in the village of Estes Park with a capacity of 50 guests. Even with this increased capacity, however, there were many persons who could not secure accommodations in this section, and hundreds of persons were prevented from visiting the Rocky Mountain National Park through lack of accommodations. I have not made a canvass of the Denver hotels with the tourist bureaus, as I did last year, to ascertain the number of people turned away due to pressure of other work. Each day the number of available rooms, if any, was telephoned from the Estes Park Information Bureau to the Denver Tourist Bureau. All of the hotels did a capacity business during the season, and a majority of them had to turn some people away, as they did last year, though no records of numbers have been kept. In spite of the increased capacity of old hotels and the opening of new ones, we are still greatly in need of additional accommodations to handle the immense crowds that visit this park, the total travel listed below, and the substantial increase, in spite of inclement weather, being, I believe, ample proof of its continued popularity.

The western slope does not show the same increase as the eastern slope, due to inclement weather, and the practical closing of the Berthoud Pass road, which is being rebuilt. During practically all of July it was next to impossible to drive over this pass, due to the road being torn up and blocked by steam shovels.

In giving the number of persons who visited the Rocky Mountain National Park this season, I must again call attention to our method of counting, which is the same as that used in 1917, 1918, and 1919. We have no entrance gates, and our only means of counting is to count the number of machines and the number of occupants that pass a given point on the Longs Peak and Estes Park entrance roads. One man is stationed throughout the day on each of these roads at the expense of the Denver Tourist and Publicity Bureau, but under my control. A conservative estimate, arrived at by actual count on average days, of the number of persons missed by checker when off duty, being 30 per cent, this is given consideration in the final results or totals, the actual count being given for information as to States and foreign countries represented. I must also call attention to the fact that, in so far as different States and foreign countries are concerned, we have no means other than auto license (and, in the case of foreign countries, our office register) of determining where the people come from, and hundreds of people are listed as residents of Colorado for the reasons that they come in rent cars out of Denver and other valley cities. The absence of suitable control of park entrances is detrimental in many ways, chief among them being the impossibility of adequately getting information of value to the people regarding the park. The following tabulations show the number of persons visiting the Rocky Mountain National Park during the season of 1920:



ENGRAVED AND PRINTED BY THE U.S. GEOLOGICAL SURVEY

Travel by States in the Rocky Mountain National Park, season of 1920, Estes Park and Longs Peak entrances.

State.	Autos.	Passen- gers.	State.	Autos.	Passen- gers.
Alabama.....	2	8	Oklahoma.....	397	1,664
Arkansas.....	21	83	Oregon.....	4	20
Arizona.....	9	33	Pennsylvania.....	22	99
California.....	99	370	Rhode Island.....	1	5
Colorado.....	20,264	87,542	South Carolina.....	1	5
Connecticut.....	1	5	South Dakota.....	29	123
District of Columbia.....	1	5	Tennessee.....	9	39
Delaware.....	3	10	Texas.....	362	1,478
Florida.....	10	34	Utah.....	1	4
Georgia.....	1	5	Virginia.....	1	4
Idaho.....	6	19	Vermont.....	1	5
Illinois.....	192	803	Washington.....	24	105
Indiana.....	14	66	West Virginia.....	1	3
Iowa.....	845	3,630	Wisconsin.....	14	56
Kansas.....	1,329	5,690	Wyoming.....	262	1,126
Kentucky.....	4	17			
Louisiana.....	4	20	Total travel classified		
Maine.....	1	5	by States.....	26,922	115,588
Maryland.....	4	22			
Massachusetts.....	4	16	TRAVEL NOT CLASSIFIED BY		
Michigan.....	64	256	STATES, BY ACTUAL COUNT.		
Minnesota.....	19	61			
Mississippi.....	5	18	Rocky Mountain Parks Trans-		
Missouri.....	622	2,627	portation Co.....	1,204	9,146
Montana.....	12	58	Rent cars.....	1,178	6,980
Nebraska.....	2,131	9,005	Unclassified, Oct. 13, 1919-		
Nevada.....	3	8	May 29, 1920.....	1,236	5,946
New Hampshire.....	3	14			
New Jersey.....	5	19	Total travel not classi-		
New Mexico.....	32	139	fied by States.....	3,618	22,072
New York.....	31	105	Add travel classified by States.	26,922	115,588
North Carolina.....	1	7			
North Dakota.....	9	41	Total travel by actual		
Ohio.....	42	161	count.....	30,540	137,660

The preceding figures are actual count, no estimate being given of visitors missed by checkers. They were obtained by having men stationed at the entrances, who counted the number of people in each automobile, or other vehicle, as they passed, the classification as to States being determined by the license number on each machine. It can be readily seen that many persons from States other than Colorado would hire machines in Denver or other points for a trip into the park; yet they must, under this system, be recorded as Colorado people. Again, all evening travel could not be recorded. Checkers were employed by the Tourist Bureau of the Denver Civic and Commercial Association from May 30 to October 1, the count prior to and after those dates being obtained from hotel registers. From calculations made at different times, after checking hours, it is estimated that we failed to record 80 per cent of the people entering the park at these entrances.

Estimated travel.

	Autos.	Passen- gers.
Estes Park and Longs Peak entrances, missed by checkers, estimated 80 per cent of count.....	13,126	63,382
Grand Lake.....	6,000	30,000
Wild Basin, on foot or horseback.....		3,000
Mummy Pass region, on foot or horseback.....		2,500
Devils Gulch.....	785	3,950
Total estimated travel.....	19,911	102,832
RECAPITULATION.		
Private cars, classified by States.....	26,922	115,588
Rocky Mountain Parks Transportation Co.....	1,315	9,620
Rent cars.....	1,178	6,980
Unclassified, Oct. 13, 1919, to May 29, 1920.....	1,236	5,946
Estimated.....	19,911	102,832
Grand total.....	50,562	240,966

Visitors from the following foreign countries were registered in the park this season: Japan, China, England, France, Spain, Syria, Brazil, Canada, India, Russia, and Armenia.

The register at the Estes Park Fish Hatchery shows that 12,107 persons, representing every State in the Union and eight foreign countries, passed through the hatchery from May 30 to August 31, when the hatchery was closed to visitors.

ROADS.

Due to the increased appropriation for the maintenance of roads the roads within the national park have been greatly improved since July 1, though the excessive amount of precipitation made it hard to keep the roads in good travel condition. Due to lack of proper drainage, and the fact that the roads were so worn out that there was little or no surfacing available, the roads washed out almost as soon as they were placed in good travel condition. In spite of this difficulty, however, we continued to gain slowly, and at the end of the season, the roads were in much better condition than they had been at any time during the past four years. A summary of work accomplished will be listed separately.

ROADS OUTSIDE OF THE PARK.

Big Thompson approach.—The State and Federal Governments completed the double tracking of the Big Thompson Road last spring, placing this approach in excellent condition. At the end of the season, however, due to excessive travel, it had become somewhat rough. Maintenance crews were kept on the road the entire season and the road will undoubtedly be placed in first-class condition again this fall. Too much credit can not be given to the State and Federal Governments for the work done. The cost of this work, including Federal aid, was \$230,677.92.

Longmont-Lyons approach.—Mr. McMillan, the new county commissioner for Larimer County and for this district, is to be complimented on the excellent work done on this approach in Larimer County this past year. In previous reports I have mentioned the excellent condition of the roads in Boulder County, to the disparagement of Larimer County. I am glad to report this year that the approaches in Larimer County are in as good condition as those in Boulder County, which makes an excellent road from Longmont to Lyons, and thence to Estes Park. The commissioners of Boulder County have continued their excellent work, and there is a possibility that this road will be double tracked in the near future.

South St. Vrain approach.—This road is still gaining in popularity, due to the magnificent scenery, and diversity of route via Longmont, through Lyons and Allenspark, via Boulder, through Lyons and Allenspark, and via Ward and Allenspark. Work has continued on double tracking the lower end of this road, and the work done thus far, if continued, insures an excellent road for this approach.

Granby approach.—The Granby approach to Grand Lake, while somewhat improved this season, still leaves much to be desired.

General information on approaches.—The Big Thompson and South St. Vrain Roads are equally attractive, from a scenic standpoint, the former following the Big Thompson River, which flows between perpendicular walls, from 100 to 500 feet in height, from the foothills to Estes Park, while the topography along the South St. Vrain changes from high-rolling country, with distant views, to valleys and deep canyons. People should enter by way of one route and leave by way of the other, to get the best results from a trip to the park. The chief inducement to travel the Lyons route is the shortening of the distance between Estes Park and Denver. While this route has great scenic value, it is not comparable to the Big Thompson or the South St. Vrain route.

ROADS WITHIN THE NATIONAL PARK.

The State and county did some work on the Longs Peak Road, within the park, this year, which improved the condition, making this road fairly good for travel. The Fish Creek Hill, which is north of the boundary line, and not within the park, has been in deplorable condition. Considerable work was done on this hill this spring, but not enough to save it from being washed by the excessive rains.

Moraine Park Road.—This road has been in better condition than any road within the park, but there is still much to be desired. Our work here consisted in improving drainage conditions and grader work a distance of 1.5 miles. This work will continue as late in the fall as possible. Due to the unsafe condition of other roads, however, work did not begin on this road until toward the end of the season.

Highdrieve Road.—While the condition of this road is slightly improved over last year, there is still much to be desired. Due to the urgency of work on other roads, work on this road did not begin until September 16, and will continue as late as possible.

Fall River Road.—The Fall River Road, one of the most traveled roads in the park, was in worse condition than any at the beginning of the season except the Glacier Basin Road. Work started on this road the early part of July and continued up to September 1. The road is now in fair condition between the park boundary line and Horseshoe Park. Beyond this point the road is in a deplorable condition, but no work has been done by us, with the exception of eliminating two extremely dangerous places on the road, due to lack of funds, and the fact that the road is still under construction by the State. Uncompleted returns show an expenditure, by the State of Colorado, on this road, of \$161,806.10, with an unexpended appropriation of \$20,000 for the relocation of a part of the old North Fork Road, on the western slope, which now becomes a part of the Fall River Road, within the park, making a total expenditure of \$181,806.10 for the construction of this road.

On September 14 Mr. McQueary, contractor in charge of construction work on this road, on the western slope, drove his machine from Grand Lake to Estes Park. On the same day I drove from Estes Park to Grand Lake, thence to Denver via Berthoud Pass, thence back to Estes Park, thus completing the loop which has been the ultimate goal of the builders of the Fall River Road. The road is now practically completed. The official opening, I am informed, will occur on September 25. From the Shelter Cabin to the foot of the hill, on the western slope, the road is in first-class condition, with the exception of three or four mudholes, which can easily be eliminated. From the foot of the hill to Grand Lake, the first 5 miles, the road is in deplorable condition, with extremely long and deep mudholes, which are hard to negotiate. It is planned to relocate this section and construct a new road as soon as Mr. McQueary finishes the work on top. The opening of this road will afford what is known as one of the most wonderful scenic trips in America, reaching, as it does, an elevation of 11,797 feet above sea level, approximately 5 miles above timber line, and virtually on top of the world. The route known as the High Line has been followed by the State highway commission, and great credit is due Mr. E. E. Sommers, State highway commissioner, for his successful prosecution of this work.

As stated in last year's report, the importance of this road to the traveler, the national park, and the State of Colorado, can not be overestimated, completing, as it does, connections between Estes Park and Grand Lake, over the Continental Divide, making possible a three days' circle trip, to and from Denver, which, for scenic beauty can not be surpassed anywhere in the world. The total distance from Denver, through the Rocky Mountain National Park, and return, crossing the Continental Divide in the national park, and again at Berthoud Pass, is approximately 213 miles.

Mill Creek Road.—A small amount of work was done on this road this season to enable us to get out dead timber. For the first time automobiles have made the trip to Mill Creek ranger station, but not with any degree of safety or comfort.

Glacier Basin Road.—This road is destined to be one of the most traveled roads in the national park. At the beginning of the season it was dangerous to travel, due to narrowness and lack of turnouts. The bulk of the road work this year has been done on this road, and it is now in good condition for travel. This road opens up an immense tract of level Government land in this park known as Glacier Basin. Our public camping grounds are located in this section, and the increase in the use of these camping grounds shows the importance of this work, which not only makes the camping grounds more accessible, but also opens up the Loch Vale, Glacier Gorge, and Bear Lake sections and shortens the distance to Flattop Mountain, making it possible to drive within easy walking distance of any of these points. Mr. F. W. Eyerly constructed a wagon road from the end of the automobile road to within one-half mile of Bear Lake, and while this road was intended merely as a wagon road, many automobiles have made the trip, thus reaching the heart of some of the wildest and most beautiful country in the park.

Fern Lake Road.—No work was done on this road this year.

Beaver Creek Road.—No work was done on this road this year.

Pole Creek Road.—The route of this road, which runs from Grand Lake to Pole Creek ranger station, was slightly changed this year, which makes an improvement over the old route. This road should be extended to the southern boundaries of the park.

General road conditions.—There is a general improvement in conditions over previous years, but due to the fact that little or no work has been done on the roads for several years past, the roadbeds are completely worn out and are greatly in need of resurfacing. While there is good surfacing material available in most instances, it is a long haul, and it would take considerable time and money to put the roads in first-class condition. Our work to date, due to the small amount of funds available, has necessarily been confined to removing bowlders, of which there are thousands, to enable us to use a grader, and improving drainage conditions. This work is necessarily slow, and does not show, but it must be done before graders can be used. Following is a summary of the work done by us this season:

Glacier Basin Road.—Cuts and fills: Cuts, 110 feet; fills, 140 feet; retaining walls, 416 feet; average height, 5.4 feet. Turnouts: Four new turnouts, 70 feet long, 20 feet wide, average inside bank cut, 4 feet; 11 old turnouts lengthened 20 feet, widened 5 feet, inside bank cut 4 feet. Bridges: One 14 by 40 feet, replanked with 4-inch plank. Culverts: Six new, installed. Double tracked: Two hundred and forty feet, 20 feet wide. Surfacing: One and one-fourth miles resurfaced, raked, and ditched; resurfaced and ditched again after cloudburst. Rocks removed: Bowlders and rocks removed from roadbed and sides of road, distance 1,800 feet heavy work, 2.3 miles light work.

Highdrive Road.—Grading: Fifty per cent completed; distance, 1 mile. Rock work: Fifty per cent rock and bowlders removed and chuck holes filled; distance, 0.7 mile. Culverts: One, 3 by 16 feet.

Fall River Road.—Grading: Ninety per cent completed; distance, 5.6 miles. Rock work: Forty per cent completed; distance, 5.6 miles. Widening: Two miles, average 8 feet, with plow and grader; 900 feet hand work. Bridges: Replanking, 4-inch plank on following—One 16 by 16 feet, one 16 by 16 feet, one 16 by 21 feet, one 16 by 21 feet (doubled planked to strengthen), one 16 by 36 feet; one new truss. Culverts: Fourteen new, installed.

Moraine Park Road.—Grading: One and five-tenths miles; 80 per cent completed. Culverts: Three installed.

Pole Creek Road.—Five-tenths mile changed; 200 feet corduroy.

Notes.—Thirty-one tons T. N. T. were removed from temporary cache to storehouse, a distance of 15 miles.

The following amounts were expended July 1 to September 15, 1920:

Labor, maintenance of roads.....	\$4, 163. 20
Necessary equipment for roads and trails.....	4, 432. 32
Supplies for roads and trails.....	1, 940. 67

TRAILS.

Trail work again this year has necessarily been confined to repair of dangerous places due to the lack of funds and the greater need of road work. Our entire mileage of existing trails should be rebuilt to make them adequate for foot or horse travel. While they are rough and badly washed, they have not been absolutely unsafe for travel with the exception of Fern Lake and Flattop Trails. The following is a summary of trail work done this year:

Fern Lake Trail.—Resurfacing, draining, filling, bog holes, and removing rocks, 2.5 miles; one new bridge, approximately 18 by 7 feet trussed.

Flattop Trail.—Resurfacing, draining, filling bog holes, and removing rocks, 1 mile. Bridges: One 5 by 12 feet, one 5 by 10 feet, one 5 by 8 feet, one 5 by 20 feet, one 5 by 30 feet, five 5 by 14 feet (average); fallen timber removed.

Halletts Glacier Trail.—Fallen timber removed.

Ypsilon Trail.—Fallen timber removed.

Storm Pass Trail.—Fallen timber removed.

Wind River Trail.—Fallen timber removed.

Bear Lake Trail No. 1.—Fallen timber removed.

Bear Lake Trail No. 2.—Fallen timber removed.

Loch Vale Trail.—Fallen timber removed.

Steep Mountain Trail.—Fallen timber removed.

Odessa Lake Trail.—Fallen timber removed.

Deer Mountain Trail.—Fallen timber removed.

Berstadt Lake Trail.—Fallen timber removed.

Longs Peak Trail.—Fallen timber removed.

Lakes Nanita and Nakoni Trail.—Fallen timber removed.

NOTE.—Amount spent on labor in maintenance of trails, July 1 to September 15, 1920, \$550.

PUBLIC UTILITIES.

This is the second season the Rocky Mountain Parks Transportation Co. has operated within the park under franchise granted by the National Park Service, and continues to prove the value of this policy. The organization has been further perfected and enlarged. The company added to last year's fleet thirteen 10-passenger cars and eleven 7-passenger touring cars and now operates thirty-five 10-passenger and eighteen 7-passenger touring cars, two 3½-ton and four 2-ton trucks. Two classes of service are given: Schedule trips leaving and returning on published time and special touring-car service which is supplied at any hour. The former best serves the travelers who are in parties of 1 to 5 and is the most popular, a total of 12,061 being carried on the Fall River and Highdrive trip; 9,234 on Longs Peak trip; 1,250 on the Loop service, while touring-car service covered 20,000 miles, no record of number of passengers being kept. The Loop service is new this season and consequently not, as yet, well known to the public, but is destined to be one, if not the most, popular trip in the park. This service was inaugurated to serve the people on hiking trips from hotels or other points to the foot of trails in the park and between or to hotels, two cars daily making the Loop from Estes Park village morning and afternoon, making it possible to take morning stage to foot of trails or other points and return on afternoon stage. The price charged being 15 cents per mile for shortest road distance between starting point and point of destination. The complete Loop will become deservedly popular as one of the best scenic trips since it affords a great variety of scenery and points of interest.

A new schedule of special touring-car rates was inaugurated this season, the charge being 50 cents per mile for the machine. This resulted in a reduction in full-car rates over last year, in some cases amounting to from \$5 to \$7, and was found to be more satisfactory from the standpoint of the travelers and the Rocky Mountain Parks Transportation Co. than the flat-trip and hour rate used last year. The following daily service has been given:

FALL RIVER ROAD AND HIGHDRIVE.

Approximately 40 miles, \$4.50; an additional charge of \$2 will be made for stop-over privilege.

Leave Estes Park at 8.30 a. m., arrive at Estes Park at 12 noon; leave Estes Park at 2 p. m., arrive at Estes Park at 5.30 p. m. Ten minutes' stop each at Chasm Falls, Divide, and Deer Lodge.

LONGS PEAK STATIONS.

Estes Park to Columbine, Hewes-Kirkwood, and Longs Peak Inn; approximately 18 miles; round trip \$2.50, one way \$1.25.

Leave Estes Park at 2.30 p. m., arrive at Longs Peak at 3.30 p. m.; leave Longs Peak at 4.30 p. m., arrive at Estes Park at 5.30 p. m.

LOOP SERVICE.

Two daily trips between Estes Park, Fish Hatchery, Horseshoe Park, Fall River Lodge, Horseshoe Inn, Fern Lake Trail, Brinwood and Stead's Hotels, Moraine Lodge, Glacier Basin, Bear Lake Trail, Sprague's Hotel, and Young Men's Christian Association. Fare, 15 cents per mile of road distance between starting point and destination.

Leave Estes Park at 8 a. m., leave Estes Park at 1.30 p. m.

Special touring-car service, 50 cents per mile and \$3 per hour waiting time for seven-passenger cars. The principal trips are:

1. Fish hatchery.
2. Horseshoe Park and Falls.
3. Fall River to Chasm Falls.
4. Fall River Road.
5. Highdrive.
6. Moraine Park post office.
7. Moraine Park to Fern Lake Trail.
8. Young Men's Christian Association conference grounds.
9. Sprague's Hotel.
10. Wind River Road.
11. Longs Peak Inn.
12. Hewes-Kirkwood Inn.
13. Longs Peak Drive.
14. Copeland Lake.
15. Wild Basin.
16. Allens Park post office.
17. Ward.
18. Lyons via South St. Vrain Canyon.
19. Gem Lake Trail.
20. Lester's Hotel.
21. Horizon.
22. McGraw's Ranch.
23. Devils Gulch-Big Thompson.

24. Big Thompson to the dam.
25. Devils Gulch-Big Thompson to dam.
26. Around Prospect Mountain.

COMBINATION TRIPS.

27. Trips Nos. 3 and 5.
28. Trips Nos. 4 and 5.
29. Trips Nos. 3, 5, 7, and 8.
30. Trips Nos. 9 and 10.
31. Trips Nos. 15 and 16.
32. Trips Nos. 15 and 17.
33. Trips Nos. 15 and 18.
34. Trips Nos. 20 and 23.
35. Trips Nos. 4, 5, and 7.
36. Trips Nos. 20, 22, and 23.
37. Trips Nos. 20 and 25.
38. Trips Nos. 6, 8, and 9.
39. Trips Nos. 6, 8, 9, and 10.
40. Trips Nos. 5, 6, and 8.
41. Trips Nos. 5, 6, 8, and 10.
42. Trips Nos. 5, 6, 8, and 9.
43. Trips Nos. 4, 6, 8, 9, and 10.

To adequately serve the increasing number of travelers, additional equipment must be purchased for the coming season.

HOTELS.

On April 30, 1920, the Rocky Mountain Lodges (Inc.) signed a contract for the erection of additional hotels within the park. Under this contract a hotel having a present

capacity of 150 guests was opened to the public on June 15, and, under the capable supervision of A. D. Lewis, president of the company, gave universal satisfaction to the guests. Other hotels within the park under Government supervision are:

Name.	Proprietor.	Capacity.	Location.
Sprague's Hotel.....	A. E. Sprague.....	50	Glacier Basin.
Lodges:			
Forest Inn.....	F. D. Tecker.....	50	Pool.
Fern Lodge.....	F. W. Byerly.....	50	Fern Lake.
Bear Lake Lodge.....	A. E. Brown.....	50	Bear Lake.
Camps:			
Timberline.....	E. A. Mills.....	10	Longs Peak.
Lawn Lake.....	Bradley & Patrick.....	15	Lawn Lake.

The nine other hotels within the boundaries of the park are located on private property and are not under the jurisdiction of the National Park Service.

BUILDINGS.

GENERAL STATEMENT.

Through the public-spiritedness of Mr. and Mrs. Frank S. Woodward, of Denver, who furnished the money for construction, and Dr. and Mrs. H. E. James, who gave the site, we have completed an entrance gate at the Fall River entrance to the park. This building consists of two lodges, 16 by 16 by 8 feet, one on each side of the road, one to be used as keeper's quarters, the other as an information bureau and shelter. The driveway, 18 feet wide, and two bridle paths, 6 feet wide, are covered by a roofed arch supported by four pillars consisting of groups of four logs. The entire building is constructed of weathered logs and makes a striking picture against the forest and rocks, adding to the beauty of the situation. The completion of this building will add greatly to the convenience of visitors to the park.

CONSTRUCTION OF BUILDINGS.

Storehouse and powder cache, 24 by 40 feet, 9-foot wall with 6-foot gable.

Ranger station, 20 by 24 feet, 8-foot wall with 5-foot gable.

Lean-to addition to barn at superintendent's residence for housing Government-owned passenger-carrying auto, 18 by 24 feet, 8-foot wall.

REPAIR OF BUILDINGS.

Superintendent's residence, minor repairs.

Mill Creek ranger station, minor repairs and new shingle roof on house and prepared roofing on barn.

Pole Creek ranger station, minor repairs.

TELEPHONE LINES.

General statement.—All telephone lines gave excellent service this season. Additional lines are necessary to adequately protect the park from fires and trespass. The Allens Park line should be reconstructed and changed to metallic circuit.

Maintenance and repairs.—Spring repairs of over 61 miles of line, while not as heavy as last year, constituted a good share of our spring work. We succeeded, however, in placing all lines in good condition before the beginning of the heavy travel. The use of lines by travelers calling in from road and trail stations for information or assistance showed a marked increase this year.

CAMPING GROUNDS.

The use of the free camping grounds in Glacier Basin is steadily on the increase. While one man was placed in charge of the grounds for part of the time to provide wood and look after the sanitation, no effort was made to count the number of campers. The widening and improving of the Glacier Basin Road has added greatly to the convenience of campers. An additional area has been cleared and other improvement will be made this fall to add to the convenience of travelers. New camping grounds will also be prepared along the Fall River Road. No great amount of work, however, has been done on these projects, due to the necessity of bending all our efforts toward the elimination of the dangerous places in the roads and the scarcity of labor.

NATURAL CONDITIONS.

GLACIERS.

The Geologic Story of the Rocky Mountain National Park, by Willis T. Lee, Ph. D., geologist, United States Geological Survey, has been of great value both to scientists and to laymen in the study of glacial action in this region. We have had hundreds of inquiries for this publication this season, and the disappointment of persons wishing the publication was great, due to the fact that it is not on sale at this office. This omission has been supplied and great benefit will occur through the sale of this valuable book this coming season.

There has been an ever-increasing interest shown in the glaciers and moraines. Due to the heavy snowfall last winter the glaciers were in normal condition. Hallett's, however, did not open this year as well as usual, the crevasses being very small and not especially spectacular. Sprague's, Tyndall's, Andrews', and Taylor's glaciers came in for more than the usual amount of inquiry.

The red fungus coloration referred to in my 1919 report continued again this year and was an object of special interest to visitors.

RANGER FORCE.

The ranger force was increased after July 1 by 2 temporary rangers, making a total of 5. This number is entirely inadequate for safeguarding the park from fires and depredations by willful trespassers. For police protection alone, we should have at least 10 permanent rangers and 6 temporary rangers from May 15 to October 1 to take care of the ever-increasing travel and to protect the public by regulation of speed limits of automobiles, prevention of fires, etc.

WILD ANIMALS.

The act of creating the Colorado State Game Refuge (S. B. No. 66) has proven of exceptional value in protecting the deer, elk, and mountain sheep that stray from the national park during the winter months. The increase in the number of wild animals this year is very satisfactory, notwithstanding the exceptionally hard winter and wet summer. Large herds of elk, deer, and mountain sheep have been seen by an increasing number of visitors this year, and special interest has been displayed by visitors in young animals, which have been very numerous. Considerable trapping of beaver has been carried on by people owning private property for the reason that the beaver destroyed aspen groves. The colonies on national park lands, however, are steadily increasing. Very few bear have been reported this year on the eastern slope, while five have been reported on the western slope in the neighborhood of Grand Lake, one becoming very tame and being seen almost daily by people visiting in that section. Depredations by mountain lions and coyotes last winter were unusually heavy, due to the depth of snow. Five mountain lions were killed by Biological Survey hunters in the park, four of them being females. National park officers killed seven coyotes.

FISH.

Fishing conditions during the State open season were very good and afforded excellent sport to anglers. Through cooperation with the Colorado State hatcheries located within the boundaries of the park 100,000 eastern brook trout were planted in the Big Thompson River at Moraine Park last spring. The usual fall output of the hatcheries is not ready to be placed in the streams at this date, but will be planted later.

FOREST FIRES.

Due to the great amount of precipitation we have had very few forest fires this year, none of them doing any damage, the largest reported being in Wild Basin, which covered an area of only approximately 10 yards square.

WINTER SPORTS.

The Colorado Mountain Club again visited the park for a three days' outing February 20-23 and enjoyed an exceptional outing at Fern Lake, the weather conditions being ideal. The increase in the length of the ski run afforded additional pleasure and excitement. One accident marred the pleasure of the outing. Mr. Ted Jelsema, volunteer employee of Host Byerly, ran into a tree with a toboggan and dislocated his shoulder.

ACCIDENTS.

No accidents of any consequence occurred in the park this season. We had almost weekly calls, however, during July and August to hunt for persons who had lost their way and had spent the night in the open without, however, any serious consequence to them since they were easily located and returned to their parties.

GRAND CANYON NATIONAL PARK.

W. H. PETERS, Acting Superintendent, Grand Canyon, Ariz.

GENERAL STATEMENT.

The Grand Canyon of the Colorado is located in north central Arizona and 80 miles south of the Arizona-Utah State line. The canyon is 217 miles long, an average of 11 miles wide, and approximately 1 mile deep. At the bottom of this gorge flows the Colorado River formed by the confluence of the Green and Grand Rivers in Utah. On January 11, 1908, a portion of the canyon and adjacent territory embracing 958 square miles was set aside as a national monument, and on February 26, 1919, the President approved the measure designating most of that area as the Grand Canyon National Park. Approximately the park area extends from the Little Colorado on the east to Cataract Canyon on the west and takes in an average of about 5 miles back from each rim of the canyon on the north and south.

The canyon itself needs no description here, being well known to practically all Americans and to thousands of foreign visitors. The area of the park not in the canyon is of the high plateau semidesert type, and on the south entirely devoid of natural water, while a few streams enter the canyon from the north.

DEDICATION OF THE GRAND CANYON.

On April 29, 30, and May 1, 1920, formal dedication exercises were conducted in the park. The Brooklyn Daily Eagle arranged their yearly tour of the national parks so

that they might participate in these exercises, their special train arriving on the morning of April 29.

The dedication ceremonies began the night of that day with a grand reception at the El Tovar, followed by a dance. Informal talks were given during the evening by Dr. George Wharton James; Mr. L. S. Williams, of Williams, Ariz.; Father Cyrene Fabre, of Flagstaff, Ariz.; Mr. H. V. Kaitenborn, of the Brooklyn Eagle party; and Director Stephen T. Mather. On the afternoon of the 30th a pilgrimage from the El Tovar to the Powell Memorial was headed by the Hopis and Navajos in their picturesque native costumes, followed by Gov. Campbell, of Arizona, the service officers, and a procession which stretched out over half a mile. Indians and cowboys escorted the pilgrims. At the monument addresses were made by Father Fabre, who told of the achievements of the early Spanish explorers; Col. H. G. Rizer, of the United States Geological Survey, told of Maj. Powell's thrilling explorations of the canyon; District Supervisor Frank C. W. Pooler, of the Forest Service, reviewed the work done on the reservation by that service prior to its establishment as a national park; Solicitor Charles D. Mahaffie, of the Interior Department, who represented the department at the exercises, told of the legal history of the park; Mr. E. M. Bassett, of the Brooklyn Daily Eagle party, spoke of the interest that is being aroused in our national park system; and Dr. George Wharton James closed the exercises with a tribute to the early explorers. Mr. Thomas Moran, the artist, famous for his paintings of the Grand Canyon scenes, was seated on the memorial during the exercises.

The formal exercises were held that evening in the lobby of the El Tovar Hotel. The principal speaker was Gov. Campbell, of Arizona, who told of the vast possibilities of the Colorado River from an industrial standpoint and offered his and the State's services in the solution of the administrative problems of the park. Mr. Meier Steinbrink, of the Brooklyn Eagle party, in an eloquent address formally dedicated the Grand Canyon as a national park. Col. James W. McClintock told of the progress of the southwestern Indians. Secakuku, the next chief of the Hopis, related in his native tongue some of the Hopi legends of the canyon, which were translated by Acting Supt. Peters of the park. Secakuku then led seven of his people in a prayer chant. Four native dances—the Hopi butterfly dance, the Navajo rain dance, the Hopi eagle dance, and the Hopi war dance—were given by freilicht in front of the El Tovar, and a formal dance in the music room of the El Tovar concluded the exercises.

ADMINISTRATION.

The administration of the Grand Canyon National Park was taken over by the National Park Service on August 11, 1919, and an organization formed consisting of a clerical and ranger force and the necessary construction and maintenance personnel to properly build and keep up the essential park roads, trails, and other utilities. The present park organization, considering the difficulties now existing in hiring efficient help, is believed to be efficient and capable of handling the necessary present and future work.

HEADQUARTERS.

Park headquarters are located in the village of Grand Canyon, Ariz., at the terminus of the Williams-Grand Canyon branch of the Atchison, Topeka & Santa Fe Railroad. The principal park hotels, transportation facilities, stores, post office, telegraph office, and other important utilities are located in the village.

JURISDICTION OF OFFENSES.

The exclusive legal jurisdiction of the park area has not yet been surrendered by the State of Arizona to the Government. Coconino County, in which the park lies, maintains a justice of the peace and, until recently, a constable. Cooperation with these officials has been close and effective.

Arrests made by park rangers of violators of the laws have always resulted in conviction and fine or imprisonment of the offender. Action toward the surrender of jurisdiction by the State has been recommended and a tentative bill drawn, which will probably be introduced in the next session of the Arizona State Legislature.

WEATHER BUREAU.

During the year observations and reports of temperature, precipitation, wind, sunshine, etc., have been made. There has also been received from the Denver Weather Bureau office daily a telegraphic weather prediction, which have been copied and posted in the hotels and garages.

WEATHER CONDITIONS.

Due to its location on a high mesa in latitude 36° north, the park throughout the summer months has constantly pleasant weather. Days are warm and almost always the sun shines. Nights are crisp and cool. The winter climate, while cold, is not severe, and very few days occur when it is unpleasant to be out of doors. It is possible to keep certain trails and roads open throughout the year, and tourists were taken on these trips every day during the past year.

RAILROADS TO THE PARK.

The south rim of the Grand Canyon National Park is directly reached by a branch line of the Atchison, Topeka & Santa Fe Railroad extending 64 miles northward from Williams, Ariz. Stop-overs at Williams are permitted on both round-trip and one-way tickets, all classes, reading to points beyond.

The north rim is reached by stage from Marysvale, Utah, a station on a branch line of the Denver & Rio Grande Railroad. Marysvale is 215 miles north of the park line, and stages make the trip twice weekly, when passengers desire transportation. The north rim is also reached via stage from Lund, Utah, on the Los Angeles & Salt Lake Railroad, the station at which tourists begin their automobile trip to Zion National Park.

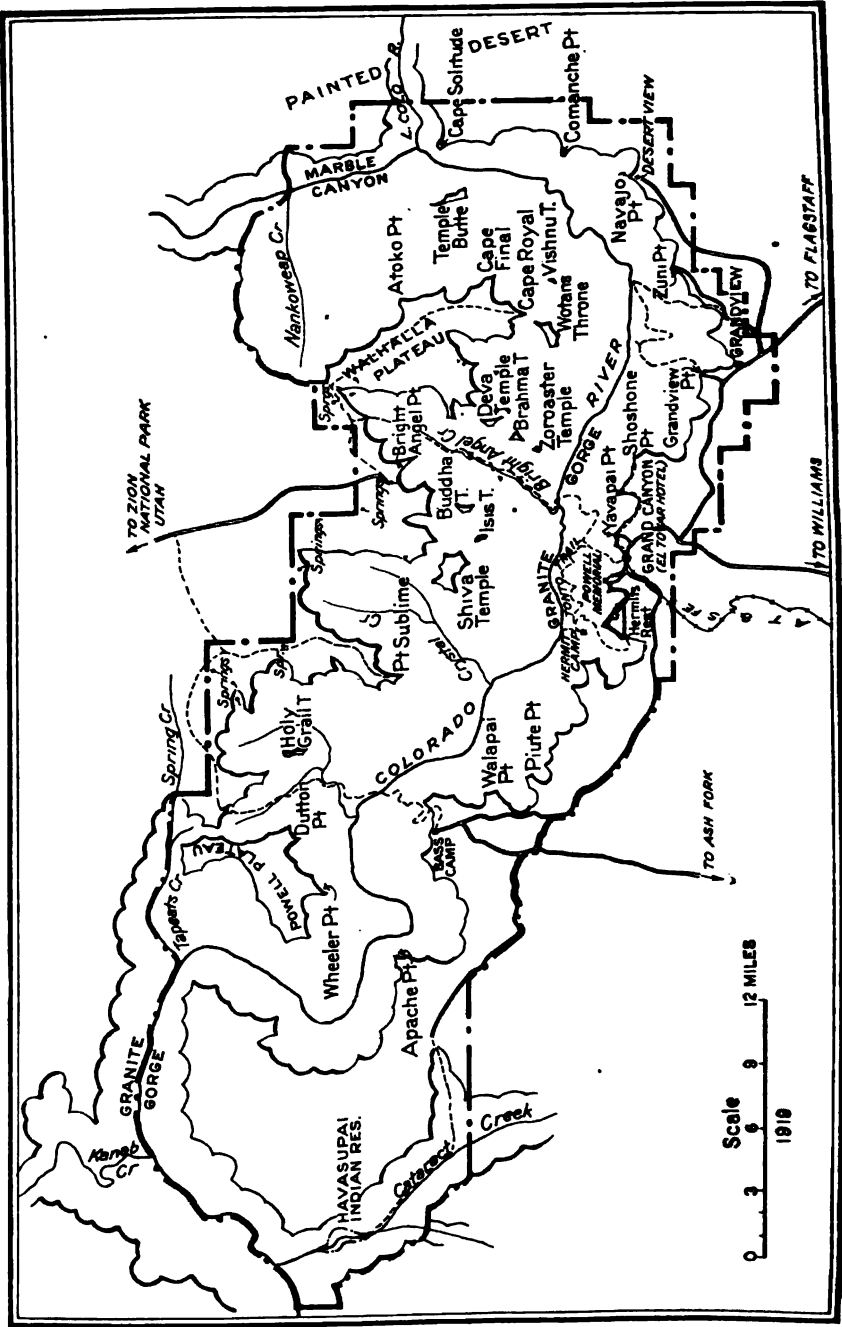


Fig. 4.—Map of Grand Canyon National Park.

TRAVEL.

Attendance to Grand Canyon National Park by train and automobile from Oct. 13, 1919, to Sept. 30, 1920.

Date.	Total attendance.	By train.			By autos.		
		Regular.	Special.	Total.	South rim.	North rim.	Total.
1919.							
Oct. 13-31.....	2,981	2,105	.....	2,105	846	30	876
November.....	2,815	2,254	.....	2,254	561	.....	561
December.....	3,884	3,400	484	3,884	.....	.....	.....
1920.							
January.....	4,166	3,646	520	4,166	.....	.....	.....
February.....	4,520	3,999	521	4,520	.....	.....	.....
March.....	4,654	4,144	485	4,629	25	.....	25
April.....	4,851	3,897	851	4,748	203	.....	203
May.....	6,076	4,402	464	4,866	1,210	.....	1,210
June.....	9,979	6,246	1,790	8,136	1,720	123	1,843
July.....	9,137	5,875	1,379	7,254	1,503	380	1,883
August.....	7,761	4,881	.....	4,881	2,553	327	2,880
September.....	6,391	4,485	147	4,632	1,639	120	1,759
Total.....	67,315	49,434	6,641	56,075	10,260	980	11,240

Statement showing automobile travel, by States, Grand Canyon National Park, from Oct. 13, 1919, to Sept. 30, 1920.

State.	Automobiles.	Passengers.	State.	Automobiles.	Passengers.
Alabama.....	3	7	Nevada.....	4	10
Arkansas.....	12	40	Nebraska.....	63	202
Arizona.....	952	3,468	North Dakota.....	4	11
Colorado.....	232	728	Oklahoma.....	168	618
California.....	424	1,414	Ohio.....	90	290
Connecticut.....	12	34	Oregon.....	13	44
Florida.....	7	19	Pennsylvania.....	45	166
Georgia.....	5	18	Rhode Island.....	3	16
Illinois.....	111	370	South Carolina.....	4	13
Indiana.....	64	208	South Dakota.....	18	53
Iowa.....	85	285	Texas.....	174	615
Idaho.....	6	17	Tennessee.....	4	12
Kansas.....	168	586	Utah.....	52	196
Kentucky.....	4	15	Virginia.....	1	4
Louisiana.....	11	32	Vermont.....	1	5
Montana.....	6	20	Washington.....	19	61
Maryland.....	6	19	Wisconsin.....	26	77
Massachusetts.....	29	97	Wyoming.....	4	6
Maine.....	9	28	West Virginia.....	4	16
Michigan.....	89	318	District of Columbia.....	13	47
Mississippi.....	1	5	Hawaii.....	5	12
Missouri.....	102	335	Canada.....	5	13
Minnesota.....	35	131	Old Mexico.....	1	2
New York.....	62	230	Australia.....	1	3
New Mexico.....	93	290	Total.....	3,260	11,240
New Jersey.....	10	34			

Train passengers making automobile and trail trips with public operator's equipment, from Oct. 13, 1919, to Sept. 30, 1920.

AUTOMOBILE.

Kind of trip.	Trips by automobile.	Persons carried.
Desert View.....	663	4,641
Grand View.....	614	4,299
Hermit Rim.....	4,854	38,836
Other trips.....	30	126
Total.....	6,161	47,902

SADDLE ANIMALS.

Kind of trail trip.	Persons making trail trip.
Plateau.....	1,004
Bright Angel.....	5,615
Hermit Trail.....	951
Loon trip.....	415
Grand View.....	1,309
Total.....	9,274

PUBLIC UTILITIES.

During the year a contract was executed with Fred Harvey covering operations on the south rim. This embraces the hotel, camp, news stand, transportation by horse and automobile, and other miscellaneous small utilities. It is considered extremely fortunate that the park should have as its principal permittee the "Harvey system" and the Harvey service. During the administration of the park by the National Park Service not 10 complaints have been made at the superintendent's office against any of the Harvey operations. On the other hand, hundreds of compliments have been heard. A list and description of the various utilities operated by the Fred Harvey Co. follow:

El Tovar Hotel, which is located at the railroad terminus at an elevation of 6,866 feet above sea level and open all the year. It is a long, low structure, built of native boulders and pine logs. There are 93 sleeping rooms, accommodating 175 guests. Forty-six of these rooms are connected with private bath.

There is a music room and rendezvous. In the main dining room 165 persons can be seated.

Hot and cold water, steam heat, and electric light are supplied. El Tovar has a steam laundry.

Bright Angel Camp, adjacent to El Tovar, offers cozy lodgings in cottages or tents. The accommodations are clean and comfortable. There are four cottages open the year round and several large tents for summer only. All of the cottages have steam heat and electric light; one cottage also has baths. About 150 persons can be accommodated here. Meals are furnished a la carte at the café. Kitchen facilities are ample for quick a la carte service.

Hermit Camp, in the canyon, on Tonto Plateau at the foot of Hermit Trail, consists of a central dining room, lounge tent, and 11 sleeping tents, accommodations for 30 persons. The Lookout is a quaint observatory and rest house, built on the edge of the rim near the head of Bright Angel Trail. It is equipped with a large binocular telescope in the tower for observing the most distant reaches of the canyon by day and for viewing the heavens by night. There is a small library for the layman and scientist. Canyon maps and photos are for sale. The reception room has spacious windows, a fireplace, Navajo rugs, and easy chairs; it is electric lighted and steam heated.

Hermit's Rest is located where Hermit Rim Road ends and Hermit Trail begins and is a unique rest house, built into the hill, with a roofed-in porch and parapet wall. As the name implies, it is intended to provide rest and shelter for parties who take the Rim Road drive or the Hermit Trail trip. Guests may sit at the tables outside or sheltered by the glass front inside, according to weather, and enjoy a light lunch amid unusual surroundings.

Opposite El Tovar is a reproduction of the dwellings of the Hopi Indians, called the Hopi House, and several Navajo Hogans.

In the Hopi House are installed collections of Indian handiwork. Here also lives a small band of Hopis, who are among the more primitive of our Indians. The men weave blankets and the women make pottery. A large stock of Indian curious and blankets are on sale.

Among other park operators on the south rim, the Kolb Bros. conduct a photographic studio at the head of the Bright Angel Trail. Here the tourist may obtain very excellent pictures of portions of the park and environs not usually photographed by the casual artist, and as a principal portion of the Kolb Bros. entertainment hear the informal lecture illustrated by motion pictures of their trip by boat through the Colorado River gorges.

Under yearly permit John G. Verkamp conducts a large curio store on the rim of the canyon east of El Tovar. Indian blankets, jewelry, post cards, pictures, etc., may be obtained here.

Babbitt-Polson Co., under temporary permit, conduct in the village public automobile camp a grocery and general merchandise store. Food supplies, camping goods, and rough clothing are sold.

On the north rim of the canyon W. W. Wiley operates the Wiley-Way Camp on Bright Angel Point. The camp consists of a main dining tent and lounge and about 10 sleeping tents. The camp is capable of accommodating with comfort about 20 persons.

ROADS TO THE PARK.

Automobile roads to the south rim of Grand Canyon leave the east and west highway at Williams, Flagstaff, and Ashfork, these points being in order given 64, 85, and 70 miles from Grand Canyon village. The Ashfork Road has been practically impassible during the year and not used. Both the Williams and Flagstaff Roads have been only fair desert roads throughout the year, as little or no work has been done. Probably 80 per cent of the travel comes over the Williams Road, but an effort has been constantly made by members of the service to route cars in over one road and out over another.

The approach roads to the Grand Canyon National Park are a disgrace to the State of Arizona and Coconino County. While they can be called fair roads in this locality and among persons accustomed to desert travel, they seem almost impassable to the Californian and eastern tourists. On account of these roads probably 60 per cent of the transcontinental auto tourists do not come to the park.

To reach the north rim of the canyon tourists sometimes make the drive from Grand Canyon village to Lee's Ferry via Tuba City, on the Painted Desert, Echo Cliffs, and from Lee's Ferry (crossing the Colorado River 150 miles above Grand Canyon Village) the north rim via Fredonia or Kanab. While extremely scenic and intensely interesting, it is a trip not usually advised. Crossing, as it does, one of the Southwest's largest deserts and traversing a country almost entirely without water and entirely without habitation except for Indian villages, it can not be attempted except by travelers acquainted and experienced in the country traversed.

Other crossings of the river can be made at Searchlight or Needles, and the north rim reached via the Arrowhead trail.

Automobile tourists from Salt Lake City and Utah points reach the park over the Arrowhead trail to Cedar City, Utah, thence to Kanab and thence to Bright Angel Point on the north rim.

ROADS IN THE PARK.

The park road system on the south rim consists of a paved rim road running 8 miles west of El Tovar along the rim of the canyon, an excellent dirt road paralleling the canyon for 32 miles east to Desert View, and over 60 miles of secondary roads leading variously to Bass Camp, Cataract Canyon, etc. These roads are in addition to the entrance roads already mentioned. The road system on the north rim consists only of the Bright Angel Point entrance road from Kanab and about 25 miles of wagon roads along the rim, very little mileage of which is suitable for automobile travel.

TRAILS IN THE PARK.

There are practically 800 miles of trails in the park, but of this amount only approximately 150 miles are used by travelers, while for over 90 per cent of the tourist travel only 40 miles are used.

ROAD MAINTENANCE AND CONSTRUCTION.

Probably the most important road job undertaken since the Grand Canyon has been under control of the National Park Service is the repavement of the Hermit Rim Road. This 8 miles of road was paved in 1913 by the Santa Fe Railroad in order that they might have a trip for winter visitors, and when taken over by the park service was practically worn out. With the introduction of motor travel on the road the pavement rapidly went to pieces and would in another few months be impassable were it not being repaved as this report is written. In addition to the above work and the regular upkeep work on the other park roads El Tovar-Desert View Road has been widened, straightened and reshaped through about half of its entire length. Many dangerous curves and grades have been eliminated and the general conditions of the road improved.

TRAIL MAINTENANCE AND CONSTRUCTION.

It has been definitely learned that on trails used by tourists descending into the canyon it is essential that constant maintenance work be carried on. The soil and rock formations through which these trails pass are constantly being loosened by the frequent torrential rains and not infrequent frosts and, owing to the precipitous nature of the canyon sides, small slides are constantly occurring. Therefore, to insure the safety of persons making the canyon trails repairmen are kept stationed at intervals along the main traveled trails. During the year, in addition to the general trail maintenance work, 10 miles of the Tonto Plateau trail was rebuilt.

BUILDINGS.

When the administration of the park was taken over by the National Park Service on August 11, 1919, there were no buildings of any description suitable for the service's needs, making it necessary to enter at once upon a comparatively extensive building program. During the fiscal year an administrative building or office, a warehouse, mess house, combined stable-garage and blacksmith shop, residence for the superintendent, and temporary residence for certain members of the park personnel were constructed. Owing to the limitation of funds that may be expended upon any building, these structures are small, but a consistent effort has been made to build as harmoniously and as much in keeping as possible.

TELEPHONE SYSTEM.

That portion of the telephone system in the park which is maintained by the service consists of about 30 miles of grounded single-wire line connected to magneto type telephones. Repairs and improvements have been made over the entire line and several new phones connected.

WATER SUPPLY.

The country comprising the south rim of Grand Canyon slopes gradually to the south, placing the village area and the entire south rim area at the crest of a divide formed by the canyon on the north and the southerly slope on the south. Due to that fact, and as the underlying strata consists of very porous limestones and sandstones there is no water available on the south side of the canyon. It is, therefore, necessary for the hotel operator to transport his water by rail from Flagstaff, Ariz., a distance of 98 miles. From 60,000 to 100,000 gallons are used daily. The park service obtains water

from the operator at cost to him, which for the last season has averaged 75 cents per thousand gallons.

A few intermittent springs and small streams occur in the canyon on the south side of the Colorado River at an elevation of about 3,500 feet below the rim, but with few exceptions the water thus obtained is too alkaline for human consumption.

The area comprising the north rim is better favored in that several springs occur close along the rim of the canyon and a few streams enter the river from that side. This area, however, is not as well watered as is generally supposed, and the camp permittee on Bright Angel Point is seriously handicapped by this condition.

SEWAGE AND SANITATION.

At the village of Grand Canyon the Santa Fe Railroad Co. has installed a septic tank and disposal plant adequate for the needs of the Harvey Co. The park's future growth will doubtless necessitate the enlargement of this plant, as the present attendance works the plant to its practical maximum efficiency.

MEDICAL SERVICE.

During the past year every effort has been made looking toward the establishment of a small hospital in the park, but the combined efforts of the local members of this service and the Harvey Co. have not succeeded in securing a physician who will undertake the work. A competent nurse is maintained at El Tovar Hotel, and doctors' services, when needed, can usually be secured among the park visitors; otherwise it is necessary to send to Williams or Flagstaff for medical attention.

FOREST FIRES.

Three fire lookout towers have been built in the park and are manned during the dry months by fire lookouts who are supplied with telephone connections to the superintendent's office. Fires thus sighted and reported have invariably thus far been located and extinguished before they attained a size sufficient to be threatening or damaging. No fire during the year has covered an area as large as 1,000 square feet, or one-fifth acre.

FISH AND GAME.

The history of game on the south rim of Grand Canyon is an interesting repetition of the beneficial effect of national-park protection. When the area was made a park and the usual dog-and-gun regulation made public, considerable outcry went up from the old-time residents of the section regarding its enforcement. These complaints were based on the statements that so few game animals existed on the south rim as to require no protection. Due to the splendid backing given the superintendent by the Washington office, the usual protective regulations were enforced, and with results very gratifying. With less than a year's protection, game animals began coming into the park, and the few left in the park area from many years of ruthless hunting showed their normal increase.

Recently as many as 30 deer have been seen in one herd, and not long ago 15 antelope adopted the park as their summer range. Small game increased noticeably, and through the efforts of park employees hundreds of birds have made the village their feeding grounds.

The north rim of the canyon and the entire park area north of the Colorado River has for years been within a game preserve. Deer, antelope, mountain sheep, and mountain lion abound in great numbers. Tourists often report seeing as many as 80 to 100 deer in a day. Mountain lion are plentiful along the canyon's rim, and these animals take their full toll of deer each season. One Government hunter bagged seven full-grown lions in eight weeks' work in that territory.

No game fish exist naturally in the park, the Colorado River containing natively the Gila trout (*Gila elegans*), carp, suckers, and occasionally a salmon. Bright Angel Creek has been stocked during the year with eastern brook trout.

FORESTS AND WILD FLOWERS.

The forests of Grand Canyon National Park are always an agreeable surprise to the first-time visitor. The canyon rims are covered with beautiful stands of western yellow pine (*Pinus ponderosa*) and Pinon (*Pinus a. dulis*). Immense tracts are forested with the gnarled one-seeded juniper or cedar (*Juniperus utahensis*), and on the north rim and in a few isolated spots in the canyon occur cottonwoods and the graceful quaking aspen. To a smaller extent there exists also some flourishing specimens of the Douglas fir, or so-called Oregon pine. The pine forests are almost entirely free from undergrowth and furnish wonderful natural saddle trails and footpaths.

I venture the assertion that this park presents the widest diversity of wild-flower growth that may be found in any part of the West. Its location in respect to latitude and the great depth of the canyon furnish almost any climatic condition and any altitude between 2,000 and 8,200 feet. In other words, conditions are favorable for plant life usually ranging between southern Canada and Central America. On the canyon rims, which reach an altitude of 8,200 feet, one finds the usual California mountain lupin, manzanita, ceanothus, the cliff rose, mariposa lilies, mountain laurel, and many other mountain plants, while at or near the bottom grow many strange desert and tropical plants and shrubs, including several varieties of the prickly-pear cactus, at least four of the Yucca family, mesquite, cat's-claw, bismaga, barrel cactus, etc. During the months of February and March, when snow lies on the rim of the canyon, the lower levels of the canyon are often ablaze with the beautiful blossoms of the various flowering cactus.

BIRDS.

No complete check list of the birds of Grand Canyon is in existence. A list of the more common varieties include the Steller Jay, Clark nutcracker, Cabanis woodpecker, slender-billed and pigmy nuthatches, mountain chickadee, junco, and the water ouzel.

REPTILES.

Many interesting specimens of reptilian life are found in the park, usually along the lower plateaus of the canyon. Lizards, from the ordinary small rock lizard to the "chuckawalla" and Gila monster, horned toads, and snakes, while not plentiful, are often seen.

RANGER SERVICE.

Due to the small appropriations and the absolute necessity of expending the greater portion of the funds on road and trail maintenance and on the necessary buildings, it has been impossible to organize the park rangers force to the extent desirable for the efficient handling of traffic, fire control, and general police work. The maximum ranger force employed consisted of four rangers and one checker. It is believed that what this small force lacked in numbers was made up by their long hours of efficient and conscientious attention to duty.

INFORMATION SERVICE.

Each ranger station in the park constitutes an information bureau for the traveling public. In addition, the superintendent's office maintains an information service, from which tourists obtain facts regarding road and trail conditions, railroad information, data on the park's flora and fauna, and information regarding other parks.

PATENTED LANDS.

There are within the park several patented mining claims, two patented homestead claims of 160 acres each, and approximately 25 acres held under easement by the public utility. The above is in addition to a 200-foot right of way owned by the Santa Fe Railroad along their track in the park.

GRAZING IN THE PARK.

From the time of earliest settlement of this region the area embraced within the park boundaries has been considered by local people as open stock ranges, and under the administration of the Forest Service it was used as grazing territory. It was, therefore, considered well to continue its use for grazing purposes until present conditions change sufficiently to warrant the exclusion of stock. Stock is grazed under permit on practically all portions of the park, except on the area occupied by the village of Grand Canyon and the area used by the camp permittee on the north rim. The village area is isolated from the range by a drift fence running from the rim of the canyon at Yavapai Point to the breaks south of Hermit rest house. However, the fence when built inclosed several head of cattle, and more have entered the restricted area through gates carelessly left open, and, owing to the densely timbered nature of the area, it has been impossible to round up and exclude all of these cattle. The stockmen have showed what might be termed a passive resistance to the exclusion of their stock from the area in question, and have, indeed, on at least one occasion, driven cattle into the area, hoping to find better feed and more water inside the drift fence than outside. Repeated warnings sent owners of trespassing stock has resulted in only half-hearted efforts to rid the village area of the nuisance. It is only by constant precautions on the part of the park organization that damage is prevented.

WATER POWER AND MINING CLAIMS.

Probably the greatest problem confronting the service upon its taking over the administration of the park was the existence of the many claims of alleged mineral value. Among these were the claims located by Ralph H. Cameron, which have been in litigation for several years. The departmental decision, dated June 29, 1920, in the case of Ralph H. Cameron et al., declared null and void the Apache, Cheyenne, Dakota, and Bannock placer claims and the Banjo lode claim. The departmental decision dated May 12, 1919, declared null and void the Banjo, Millionaire, Sentinel, Treasure, Peg Leg, Hill Top, Sunflower, Tombstone, Goldenole, Ida May, and Butinsky lode claims and the Cheyenne, Dakota, Bannock, Apache, Folly, Hermit, and Gorge placer claims.

A group of mine claims were located in Cataract Canyon in 1906 by W. I. Johnson, who at the same time filed power rights on the four waterfalls in that canyon. An option on these claims and water rights has been taken in the past year by C. A. Heberlein, who has made application to the recently created water power commission for permit to investigate and report upon the commercial feasibility of the holdings and to submit plans, specifications, and estimates of development proposed by him.

Another small group of claims are held by W. W. Bass. These claims are alleged to contain commercial copper and asbestos and are located in the canyon in the vicinity of Shinnemo Creek. The mineral value of these existing valid claims has not been investigated by the service or, to my knowledge, by any representative of the department.

While other claims are scattered through the park area, the only ones worthy of mention in this report are the copper claims filed upon by the Canyon Copper Co., on the Horseshoe mesa below Grand View Point, and a group of asbestos claims held by the Canyon Asbestos Co., across the river from the Horseshoe mesa. Actual and extensive mining operations have been conducted on these claims and a large quantity of copper ore removed and shipped. The operations ceased a few years ago owing to the increased cost of labor and transportation and the decreased price of copper. It is not believed that operations will be resumed on these claims.

RECOMMENDATIONS.

Measures to place the park under Federal jurisdiction should be promptly instituted. Enforcement of regulations and keeping of the peace is needlessly complicated under the present system of combined State, county, and Government control, even with the existing cooperation between the various officials.

ROADS AND TRAILS.

The most constant and insistent complaint of visiting tourists is based upon the lack of trips in and about the canyon. At present there are only two short automobile drives on the south rim, the Hermit Rim Road, 7½ miles long, and the Desert View Road, 32 miles long, which does not, however, follow the canyon's rim and only affords five canyon views through its entire length. The north rim of the canyon, while presenting by far the best views and the best camping country to be found within the park, is practically without roads, and its trails are all but impassable. Estimates covering the beginning of a logical road and trail system have already been forwarded the service, and it is recommended that every effort be made to obtain the funds specified.

It must be remembered that the Grand Canyon had not the previous constructive administration accorded other areas before becoming parks and, therefore, is far behind in road and trail construction.

NORTH RIM TRANSPORTATION AND HOTELS.

Steps should be taken looking toward the organization of a transportation and hotel company for the north rim area. The possibilities of development on the north rim are enormous, and it is believed that with proper transportation service the attendance there will increase by leaps and bounds until it equals that of the south rim.

INCREASE IN PARK AREA.

The El Tovar-Desert View Road passes out of the park about 3 miles east of Grand View and reenters the park at Tanner Tank. This condition places approximately 10 miles of this important road outside the park limits and does not allow maintenance and upkeep work from park funds, nor the enforcement of park regulations on part of a road driven almost exclusively by park visitors. It further necessitates the existence of two checking stations, with their attendant expense, which could be eliminated if the park boundaries were changed to include the 10 miles of road in question. It is, therefore, recommended that action be taken toward the passing of legislation to include sections 13, 22, 23, and 24, township 31 north; range 4 east, Gila and Salt River meridian, and sections 7, 8, 17, 18, 19, 20, and 30, township 31 north, range 5 east, Gila and Salt River meridian, within the park boundaries.

LAFAYETTE NATIONAL PARK.

GEORGE B. DORR, Superintendent, Bar Harbor, Me.

GENERAL STATEMENT.

Lafayette National Park has steadily advanced throughout the year in extent in public recognition, in use, and opportunities for usefulness. Its register, placed at the Bar Harbor entrance to the park and signed by a fraction of its visitors only, shows these coming from 29 States of the Union and representing citizens of every type. A marked feature this year has been the coming from other, and often distant, States of people with motor-camping outfits, a method of travel that seems destined to grow rapidly to large proportions. One party of this kind, containing the president of a western university, came all the way from Lansing, Mich., and every nearer State has been widely represented in the motor list. For such parties the park offers unlimited opportunity, while the roads leading to it along the Atlantic coast or from the New Hampshire mountains are being steadily improved by State and town, the whole of New England being interested in furthering such travel.

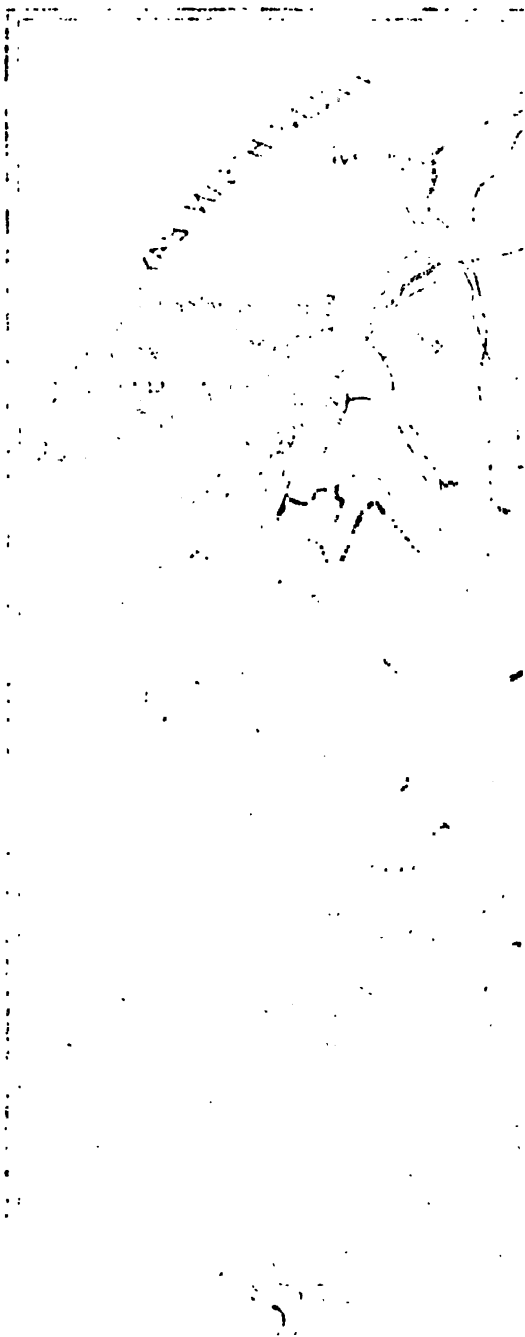
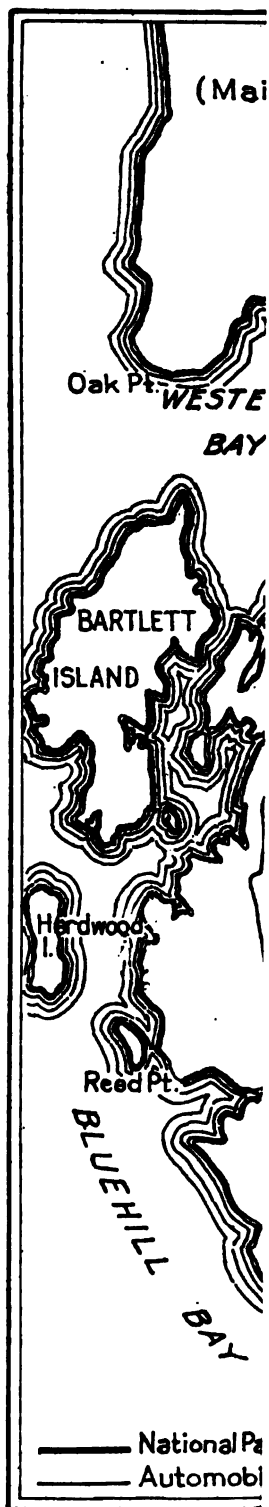
A plan is under consideration for marking important through routes leading to the park from other centers with a special park sign, easily recognizable, which can be placed at need in association with other signs along highways leading elsewhere, such as the Atlantic Highway or the International Highway, with which roads to the park may chance to coalesce for a portion of the way.

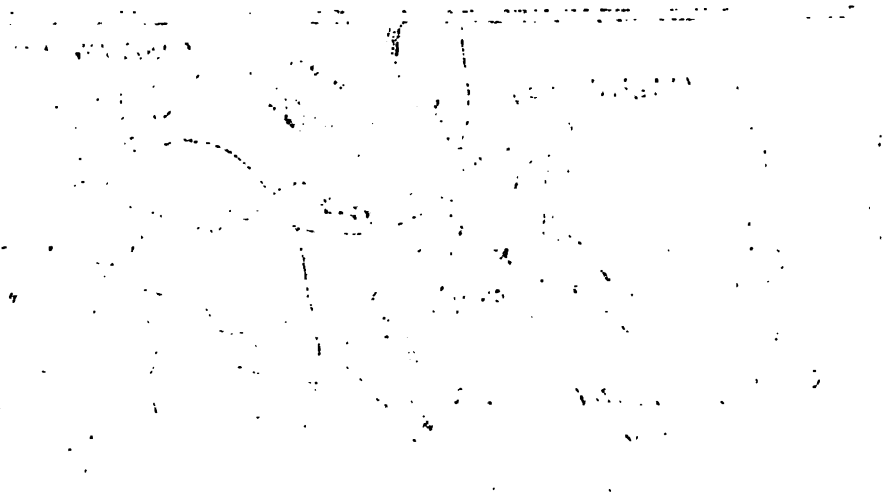
The hotels in the coast resorts surrounding the park—at Bar Harbor, Northeast Harbor, Southwest Harbor, Seal Harbor, and Somesville—have had a full and crowded season. At Bar Harbor, the main entrance to the park, additional hotel space and a new hotel of modern type are greatly needed, but the need is fully recognized by the transportation companies bringing people to the park and island, and a new hotel at Bar Harbor upon a magnificent site on Frenchmans Bay has been delayed only in construction by the war and the building conditions resulting from it, the land being secured by the Maine Central Railroad and plans prepared. What is accomplished in general for the housing and entertainment of visitors in our western parks by granting concessions is done at Lafayette National Park by private and corporate initiative working under the stimulus of competition, competition not only of individual with individual, but of locality with locality.

TRAVEL.

There are no means of giving other than conjectural estimates of the travel to Lafayette National Park, as it is approached both by land and water, by train and motor. It is also served by a number of resorts established on the coast around it, and none of these keep data in any systematic way. The railroad report on the season's travel, deducting allowance for local use, shows approximately 31,500 travel for the season. The bridge to the mainland being now free from toll, there is no means of checking accurately those which should be counted as bringing visitors to the park should be reckoned at not less than 10,000, bringing doubtless over 30,000 people. Steamboat service seems to have fallen off this year in proportion to former years, while other services have increased, and may be reckoned at approximately 5,000. Therefore the number of visitors to Lafayette National Park is estimated at 66,500, an increase of 2,500 over the travel of last year.

Lafayette National Park has grown steadily by important gifts, which the act creating it enables the Secretary of the Interior to accept upon his and the park service's ap-





proval. These gifts, indications of the warm interest the park inspires, are widely various. One such, recently acquired, will give the park, when accepted, nearly a mile of wild and beautiful ocean front additional to and distant from what it possessed before. Another comprises the greater portion of the shores of a wild, State-owned lakelet sunk in woods and bordered by a hill. St. Georges Hill, included in the gift, the view from which has long been famous locally. A third gives the park a brook ravine, that of Duck Brook, of singular and romantic beauty, cut deep into the ancient rock and overhung with trees, which for two generations has been a favorite walk from Bar Harbor and will now make a delightful and appropriate entrance to an extensive park-land area. A fourth gift, a fifth, and a sixth assure important features of the immediate entrance from Bar Harbor, bringing the park lands down to meet the highway and to border on the beautiful, far-stretching golf links for which Bar Harbor now is famous.

Another interesting gift to the park of different character from these has been that of letters bearing the signature of Henry IV of France, who gave De Monts his commission for the founding of Acadia, which led to the discovery and naming of Mount Desert Island by Champlain in 1604, and of Louis XIV, who gave the island, two generations later, to Antoine de la Mothe Cadillac, the founder of Detroit, to whose granddaughter the Commonwealth of Massachusetts freely reconveyed its eastern portion in 1788, a great part of the deeds to the present national park land proceeding directly from her and bearing the signature, "Marie de Cadillac." These gifts both come from the same donor, who presented last year the autographed letter of Lafayette, written in English, on the occasion of his visit to Maine in June, 1825.

WILD LIFE.

The ranger force of the park has been largely successful in protecting its wild life during the past year. A herd of some 40 deer sheltered in the Eagle Lake and Southwest Valley region of the park during the winter and at one time, when deep snow had covered all food but the bark of trees and the browse of twigs, hay was sledded in to them across the deeply buried surface of Eagle Lake by two of the rangers. During the summer these deer have been variously seen in twos and threes in open spaces within and bordering the park, and at drinking places, and their tracks are numerous within the woods.

Two beavers were presented to the park by the fish and game commission of the State, one of which was placed at Eagle Lake and passed the winter there successfully, damming a brook that enters the lake from the gorge of Bubble Pond; the other, escaping at night before being taken to the lake, wandered extensively, as his gnawing of the trunks of trees disclosed, not only along watercourses but through the woods that separate them, and up rocky slopes, and finally established himself upon a brook descending from the mountain side whose waters were frozen by the severe cold of the winter, leading to his death.

This spring three other beavers have been presented to the park by the State fish and game commission, and all four are now successfully established in it, two young beavers, born to a pair of these, having been lately reported as seen by one of the rangers.

The ruffed grouse, or partridge, as the bird is here generally known, which had been becoming rare to danger of extinction, has increased largely during the past year in the park and may now frequently be seen along its walks and climbs.

Wild ducks wintered in large numbers in the lakes and ponds of the park, seeking the ocean—especially where brooks come down to meet the sea—when the park waters were closed by ice. Hundreds were to be seen together in the late winter where Duck Brook flows into Frenchmans Bay. These were protected outside the park by State law, whose observance the park rangers were able to help materially in securing. Wild geese, too, sheltered in Eagle Lake and other waters of the park during their migration in the fall, and were protected there.

NATURAL HISTORY.

The park has become a field of study to biologists, who universally regard it, owing to its situation between land and sea, its remarkable concentration of landscape form, and its position where boreal and Appalachian floras and faunas meet as an extraordinary opportunity for the preservation and study of our native life in wide variety. One of the leading entomologists in the country returned to it this summer for the third season to study its insect life, which he states to be extraordinarily rich in rare and interesting species and on which he plans a publication later in book form. A leading forester and dendrologist is similarly at work upon its forest problems, studying them with similar intent. A marine biologist is at work upon the rich material offered by the ocean life dwelling on its shores, and material is being steadily gathered for a book upon its flora. In a few years' time the park, with the added interest of its geologic form and plainly written geologic records, should become one of the most interesting opportunities to naturalists upon the continent for work and observation.

FOREST PROTECTION.

Some protection for portions of the park forest was secured last winter by permitting inhabitants of the island who were out of work to obtain their winter firewood, greatly needed, by clearing the park woods of dead and inferior trees, under the immediate direction of the rangers, the areas so dealt with being cleared of rubbish in return for the wood obtained and the slash from the cutting being burned in selected places under safe conditions. The need of this work, however, on an extensive scale is urgent in the park, whose woods, stretching widely across the island from end to end, form one of its great beauties and sources of interest.

A serious fire, which burned over several hundred acres of land in the park, occurred in the early spring, originating in a fire built on the lake's edge by men fishing in Great Pond, and spreading thence uncontrollably until rain came. This fire started outside the present boundaries of the park, but rapidly invaded its woods. The full ranger force of the park was out night and day while the fire lasted, as well as crews from the neighboring towns. The blackened trunks of trees left now constitute a serious problem for the park management, as their removal over so large a district will be costly unless some one can be found to cut them for such wood pulp or other value as the charred trunks may still contain.

COOPERATION OF THE STATE AND REGION IN THE DEVELOPMENT OF THE PARK.

Full cooperation has been given the park by the State of Maine and by the towns in which the park is situated. The State fish and game commission is employing, at the State's expense, a warden to strictly enforce its laws upon Mount Desert Island and to cooperate with the park in the establishment of a true wild-life sanctuary within its bounds. The State department of education is using publications to give children in its schools knowledge of the old historical associations and past history of the region. And the park itself, with its wonderful scenic features, is rapidly becoming a point of motor resort and unique interest to citizens of the whole State.

The towns within which the park lies, representing the old New England form of town government which has had so great an influence on the political development of the country, are similarly and intimately cooperating with the park management to make the park a great resort and give it a character of unique distinction. In this also the village-improvement societies, representing the long-established summer life upon the island, are similarly cooperating and have appointed each a representative to confer with the park management and aid it in its work and in the study of its problems.

PUBLICITY.

Wide publicity of high character has been given the park both by the press and in current publications during the past year. Long illustrated articles upon it have appeared in the Sunday issues of leading newspapers in cities ranging from Washington to Chicago, cities which may be regarded as lying within the park's immediate reach, and great interest has been shown in its establishment as an eastern park representative of our eastern landscape and its associated life. An illustrated article on the geology of the island was printed in the Philadelphia Geographical Society's Bulletin, last winter, written by Dr. Bascom, of Bryn Mawr College, and a reprint of this was made which has been given wide circulation.

This summer an article on the early history and old French associations of the lands now occupied by the park was published, with attractive illustration, by *La France Magazine* issued in New York; and what is in substance another article has just been issued by the *Journal of the American Natural History Museum*, consisting of a series of carefully selected pictures, with descriptive legends and a word of introduction, calling the attention of the New York public and the Museum subscribers to the importance in a wild life and scientific sense to the park's establishment.

Allied to publicity, but belonging really to an educational field, is the exhibition of an extensive collection of park photographs in enlargement, with appropriate legends as a central feature, in an educational exhibit organized by the French department of the great Washington Irving High School in New York. This exhibit, spontaneously asked for by the committee, is still making the rounds of the high schools in Greater New York, shown for a week at each high school and to an audience of pupils that when the circuit of the high schools is completed will have reached the number of from 60,000 to 70,000. It is intended by the committee in charge that after this circuit is completed this same exhibit shall be sent to other cities in New York State, similarly to make the rounds of their high schools and carry the interest of the park, its nature, its scenery, and its old associations to the youth of the whole Empire State.

One of the teachers in charge of this exhibit, born in Maine, has become so much interested in the subject of the park through these pictures and their legends that she has prepared a lecture on Lafayette National Park and its early historical associations, illustrated by slides presented by the park management, which she has signed a contract with the department of education of the city of New York to deliver wherever and whenever called upon, and has already dates assigned her, commencing in October.

Two other sets of slides were presented in the spring to the American Museum of Natural History for use in its educational lecture work, and an opportunity clearly presents itself to make the park through the educational departments of our crowded Eastern States and cities an instrument of wide reach for interesting the younger generation as it comes along in the campaign for nature conservation and to develop in it appreciation of the interest of living things and of natural beauty.

CONSTRUCTION.

The appropriation for the fiscal year ending June 30, 1920, made while the war was still in progress and Lafayette National Park was still a national monument, provided nothing more in general than has proved necessary for administration and maintenance and little could be done beyond these in new construction. Work along these lines was still rendered possible in special instances, however, by the interest of citizens, and good progress has been made in path construction and since July 1 in the commencement of the new year's work.

RECOMMENDATIONS.

The lands now belonging to Lafayette National Park or in process of acceptance by the Government, waiting only for the clearance of the titles they are held by, stretch for a distance of over 15 miles from east to west as one must pass to traverse them. There are a dozen distinct mountain peaks of remarkable boldness divided by gorges, lakes, and streams; there are meadow lands and extensive woodlands; and there are also portions with wide ocean frontage. Over this territory there are scores of miles of old trails to keep in order, repair, and improve; there are new paths, important to the park, urgently requiring to be built; there are roads and bridle paths to be built to make accessible splendid portions of the park; there are ranger huts to be provided at selected points within the park necessary to its protection; there is extensive work to be done for the protection from fire of forest areas and to open them for public use and enjoyment; there are areas of disfigurement, the result of recent and former fires, to be improved; surveys are needed and the clear delimitation of the park area where it meets private land; and plans involving fresh surveys should be in preparation that progress may be made toward the adoption of a definite plan and policy for the park.

To accomplish these things will involve the work of years dependent upon the appropriations annually granted to the park; all the work here outlined is important and

something if possible should be done in each direction each succeeding year. If one must make selection, good path construction is the most important for the use and enjoyment of visitors. For the conservation of the natural beauty of the tract forestry work in the interest of fire protection is the most important, as a single sweeping forest fire, starting as this spring in time of drought and fanned by a strong wind, may disfigure for a generation tracts of rare present beauty and leave them not only ruined but far more expensive to deal with than the good care that would insure their safety.

The superintendent would therefore recommend such work along all these lines as Congress may make possible by its appropriations, but would lay special emphasis on the work in the two directions here suggested: Good path construction and efficient forestry, with the two aims of forest beauty and fire protection as its goal.

ZION NATIONAL PARK.

WALTER RUESCH, Acting Superintendent, Springdale, Utah.

GENERAL STATEMENT.

The Zion National Park was created by act of Congress November 19, 1919 (Public 83, 66th Cong.), making it the nineteenth member of the national-park system. A portion of the area was originally set aside as a national monument by presidential proclamation July 31, 1909, under the name Mukuntuweap. By presidential proclamation of March 18, 1918, the monument was enlarged and the name Zion, as the canyon was called by the early settlers, bestowed.

The park contains approximately 120 square miles, or 76,800 acres, and is located in the extreme southwestern part of Utah. It is reached by rail from both Salt Lake City and Los Angeles by the Salt Lake route to Lund, thence by motor stage a distance of 100 miles. It is also reached by motor from either Los Angeles or Salt Lake City over the Arrowhead Trail, an all-year route. The canyon proper is approximately 8 miles long and from 25 feet to one-half mile in width with sheer walls rising from 800 to 2,000 feet high.

ROADS AND BRIDGES.

The main road to the park is about 4 miles in extent and constitutes a branch of the Arrowhead Trail. Because of the fact that this is a new spot in the scenic world, appropriations have been very meager. However, the road is very good compared with other earth roads. A trail leading to the East Rim leaves the floor of the canyon at Cable Mountain and is accessible on horses. Foot trails lead to a number of beautiful canyons and heights. The maintenance of the road has been very expensive because of much flood water, the effects of cloud-bursts on the higher plateaus.

SCENIC BEAUTIES.

When within 20 miles of the park one is charmed and amazed at the first glimpse of the West Temple, which towers 7,650 feet above sea level, or 3,900 feet above the canyon floor. It stands out so very prominent that it predominates the whole surrounding country. Near the park boundary line one passes the Watchman on the east (elevation 6,250 feet); the Streaked Wall with towers 6,900, 6,950, and 7,200 feet, respectively, on the west; again on the east Bridge Mountain, East Temple, and Mountain of the Sun. Immediately to the west stands the Three Patriarchs, ranging in elevation from 6,650 feet to 6,700 feet. The Wylie Camp is just beyond—nestled in a shady nook where the weary traveler can enjoy the refreshing breezes, clean beds, and appetizing food. Here one can obtain guides and horses for visits to Heapes Canyon, El Gobernador, Angels' Landing, and Cable Mountain.

STREAMS AND WATER SUPPLIES.

The Rio Virgin flows through the park, and except during the rainy season is perfectly clear, and good for culinary use; however, it is not necessary to use it for the park abounds with clear sparkling pure springs. At the Wylie Camp the water is piped from one of these springs, which furnishes water in abundance for camp, garage, and tourist use.

TRANSPORTATION FACILITIES.

The park is reached from Lund, Utah, 102 miles in a northerly direction on the Salt Lake Route, by the National Park and Transportation Co.'s automobiles in seven hours; the road leading over a desert a distance of 32 miles to Cedar City and from there to within 35 miles of the park through beautiful fields of alfalfa and waving grain. The remaining 35 miles leads up the Rio Virgin, passing a number of thriving settlements which produce an abundance of all kinds of fruits (except citrus); berries, alfalfa, corn, and sorghum cane fields abound everywhere.

PUBLIC CAMPING GROUND.

A public camp ground has been constructed 1 mile north of the Wylie Camp. A great many people have used it since its completion in July of this year. Spring water is piped from one of the canyons and provides water for all purposes. The camp is located within sight of El Gobernador, Angels' Landing, and within 1 mile of Cable Mountain. Thick foliage and trees provide shade in abundance.

VISITORS.

This year we have established a record for the number of visitors. We have had 3,692 visitors in the park during the season just ended. It seems that an organized campaign should be inaugurated and some good system of publicity energetically adhered to, for the bulk of our visitors come from Utah and near-by States, which indicates that we are not well enough known; however, we have had a few visitors from Europe and other

foreign lands. Two hundred and seventeen Boy Scouts from Salt Lake City, with their scout masters, visited the park for a two-day stay during July. Our eastern and western visitors have been mostly professional people. Three very prominent artists have spent much time in the park this season: in fact, a Mr. J. B. Fairbanks, of Salt Lake City, has spent the past three seasons painting, and says he has only begun. A number of photographers have spent considerable time here also.

Tourists visiting Zion National Park, season of 1920.

Means of transportation.	Number of vehicles.	Passengers.
By automobile.....	644	3,354
By wagons.....	36	206
By motor cycles.....	4	6
By horseback.....		66
Total.....	684	3,622

Distribution of travel by States.

State.	People.	State.	People.
Arizona.....	17	Oklahoma.....	3
California.....	112	Oregon.....	1
Colorado.....	11	Pennsylvania.....	28
Connecticut.....	2	Rhode Island.....	1
Idaho.....	43	Texas.....	4
Illinois.....	19	Utah.....	3,206
Indiana.....	13	Washington.....	9
Iowa.....	3	West Virginia.....	2
Massachusetts.....	77	Wisconsin.....	3
Michigan.....	10	Wyoming.....	11
Minnesota.....	9	District of Columbia.....	9
Missouri.....	5	Hawaiian Islands.....	1
Nebraska.....	24	Foreign countries:	
Nevada.....	33	Australia.....	1
New Jersey.....	11	Canada.....	3
New Hampshire.....	2	Holland.....	1
New York.....	9		
North Dakota.....	1	Total.....	3,622
Ohio.....	8		

STATE GAME PRESERVE.

A State game preserve has been established which joins the park on the east and north. It comprises townships 40 and 41 south, range 9 west. This will have a tendency to increase the wild game within the park boundary. Many white-tailed deer have been seen this season, and as they learn of the protection afforded, the park will abound with them.

PREDATORY ANIMALS.

The coyote, wild cat, porcupine, skunk, and badger are found in the park. The gray squirrel has become so numerous that they have grown very familiar with tourists in their camps.

BIRDS.

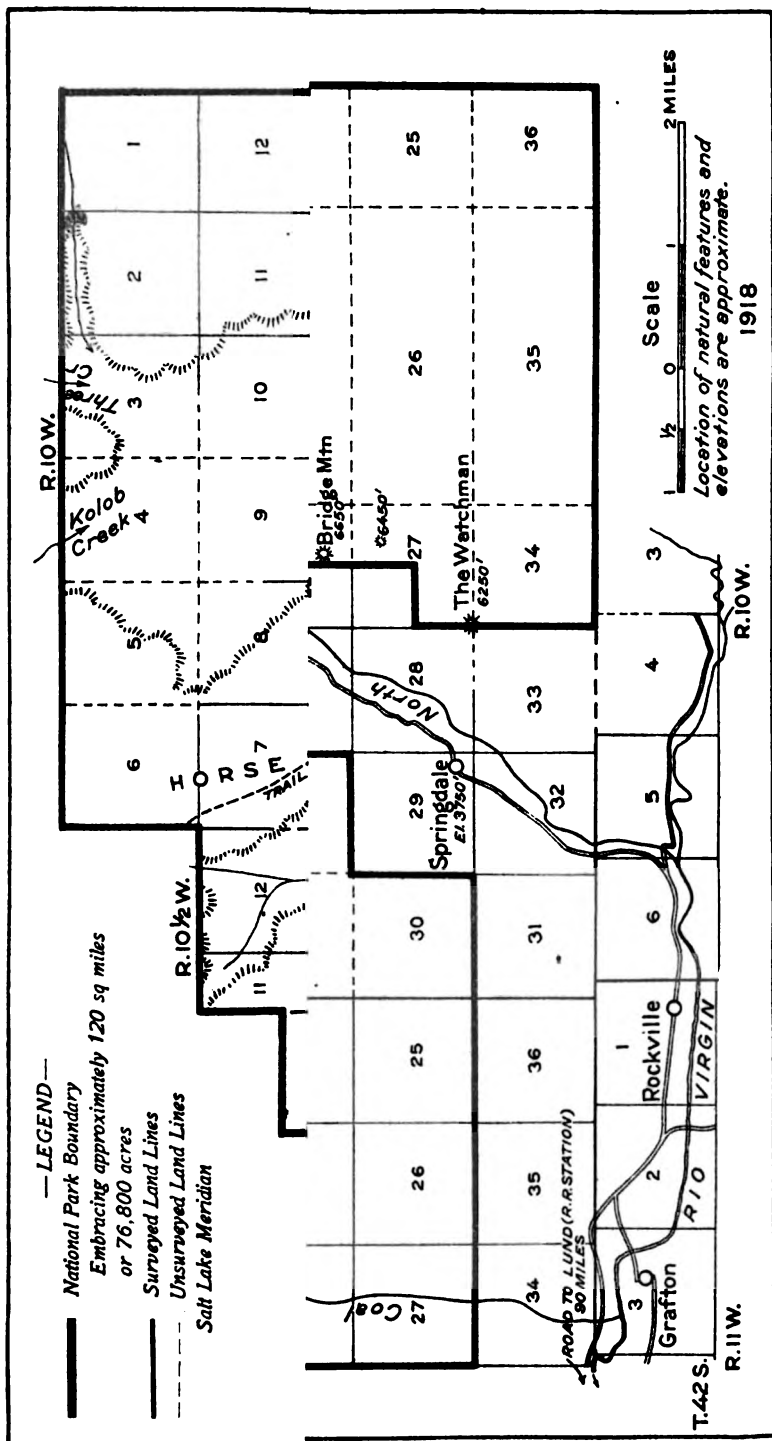
Bird life is increasing in the park. Among the different varieties are chimney wren, song lark and English sparrows, red wing blackbird, blackbird, bluebird, blue jay, several species of humming birds, meadow lark, road runner, crow, and five species of hawks, mourning dove, downy woodpecker, read-shafted flicker, chippy, a variety of canaries, and robin.

GRAZING.

Grazing privileges granted the neighboring ranchers has been the park's only source of revenue. With the exception of one permit, cattle and horses are permitted to graze within the park boundary. One permit for the grazing of sheep was granted on the west rim where visitors have not set foot because of the inaccessibility of the roads.

PERMITS.

Grazing permits were granted to the following: K. A. Esplin, William Gifford, Howard Wilson, W. C. Wilson, G. A. Isom, Ben Demill, David Hershey, H. T. Atkin, Angus Bullock, J. W. Imley, David Terrey, and John Winder. Special use permits were granted to F. D. Gifford and O. D. Gifford, from which the sum of \$346.50 was received.



MAP OF ZION NATIONAL PARK.

12499—20. (To face page 318.)

CAPULIN MOUNTAIN NATIONAL MONUMENT.

Mrs. WILLIAM H. JACK, custodian, Folsom, N. Mex.

Capulin Mountain National Monument, containing 680.37 acres, "A striking example of recent extinct volcanos, and of great scientific and especially geologic interest," was set apart as a national monument August 9, 1916, and is located in Union County, N. Mex.

The year has been a good one for Capulin. Late snows and early rains made grass plentiful, and the surrounding country has been very beautiful and attractive to the many visitors.

There are a few wild flowers, but limited in variety. Trees are scattering except on southern slope. They consist mostly of pinon, a few pine, and some scrub oak. The great piles of lava rock in the area surrounding the base of the mountain are very beautiful in formation and coloring. Wild animals are few and far between; some rabbits and an occasional coyote are all one sees in a day's ride.

August 8 Ivan Shoemaker and George McJunkin began a survey for me of the boundaries of the monument. We covered part of the eastern and southern lines, when rain cut short our work. We hope to complete the survey later.

The road between Dedman and Folsom is most used by tourists and other visitors to approach the mountain, as it passes just at the base. About 1 mile of this road is on the reserve, and is in very good repair, but other portions could be greatly improved by some work. There is an old road, entirely on the reserve, more than a mile in length, parts of which are impassable, having been washed by heavy rains. This road leads to a shoulder of the mountain, and if it could be changed in places and rebuilt would facilitate the approach of automobiles and make a shorter climb for those who wish to go to the top and view the crater.

More tourists than ever before have visited the "volcano" this year. August and September are the record months; and though we do not keep an accurate account of all visitors, it is estimated 600 autos, averaging five persons each, have stopped at the mountain. Most of these came in from Dedman, some from Folsom, and a few from Des Moines. It has been a popular picnic ground for the neighboring towns and ranchers. There was a passenger aeroplane, with landing at Dedman, for a few days in August, kept busy flying over our beautiful mountain, hovering like a huge dragon fly.

Total number of visitors estimated at 3,200.

CASA GRANDE NATIONAL MONUMENT.

FRANK PINKLEY, custodian, Blackwater, Ariz.

The Casa Grande National Monument consists of 460 acres of land lying in the south-central part of Arizona at an altitude of 1,422 feet, and is a typical spot of desert scenery, being level ground on the floor of the Gila Valley, covered with a growth of mesquite, creosote bush, and salt bush.

The reservation was set aside by Executive order dated June 22, 1892, under an act approved March 2, 1889 (25 Stat., 961). The boundaries of the reservation were changed, without changing the area, by a presidential proclamation dated December 10, 1909. On August 3, 1918, by presidential proclamation, the reservation was made a national monument under authority of an act of Congress approved June 8, 1906 (34 Stat., 225), and placed under the jurisdiction of the National Park Service, which had been created by the act of Congress approved August 25, 1916 (39 Stat., 535).

The name "Casa Grande" or "Great House" was first applied to the large central building by Father Kino, who was, so far as we know, the first European person to visit it, he having reached it from his mission Dolores in 1694. At that time the Casa Grande stood, a burned-out, dismantled group of walls, and had been standing so for at least two centuries prior to his visit.

Down to the present time no one has, so far as I know, offered a complete hypothesis covering the rise and fall of the civilization which built and inhabited the Casa Grande ruins. The evidence thus far gathered is so small as to make positive conclusions of rather doubtful value, but it has long seemed to me we have enough facts to build up a working hypothesis which might be of value in pointing to the weak spots in our knowledge where facts are missing, and thus lead us to make further investigations.

No long migration of these people to this valley is demanded. They may have come less than 150 miles when they decided to settle here. In the many shifts of population which have occurred in the Southwest it is my opinion these people arrived in the mountainous country in what is now east-central Arizona. The nature of the country there prevented them from becoming farmers. They were hunters, which means that, within certain limits, they were more or less nomads. This means that they must have been people of little property, for the game shifted year after year from one mountain range to another, and they must follow the game. Without means of transportation—for the horse and ox were not yet on the American continent—they could not accumulate property. Their effects must be rude and simple so they could move with little trouble.

Gradually they came to the conclusion that the nomad's life was not a satisfactory one. Probably the southwestern edge of their population reached far enough down into the flat valleys to experiment in a crude way with irrigation, and thus the remainder, in the course of time, came to the conclusion, that it would be better to go down into the valleys, take ditches from the river, and farm by irrigation. In this way they could become settled property owners with a much more regular food supply and could build better houses because they need not abandon them so often as they must do with their mountain dwellings.

The change was made, and so we get them established in the valley, but not yet in the village where the Casa Grande ruin now stands. The first settlements in the valley must have been very close to the banks of the Gila River, for they must live by irrigation and they would first irrigate that land which could be reached by the shortest possible ditch.

No especial engineering skill was needed in taking these ditches out of the river since the ground here was fairly level. If they were in doubt they could run a very small

pilot ditch into the doubtful ground and soon find out whether or not the water would follow. Having once found the grade, it would be a simple matter to enlarge the pilot ditch to any desired capacity.

The first houses were crude brush affairs, probably of arrow weed and the other small reeds and brush which grows along the river banks. Some one plastered mud on his brush walls to keep out the wind, and they then discovered the mud-plastered wall made a cooler house during the hot summer months. The tendency then was to make thicker walls, because thicker walls would make a cool house in summer and a warm house in winter. This thickening process went on until the wall was 3 or 4 inches thick, when it began to prove unsatisfactory. It was not yet wide enough to stand on its own base and support its own weight, and it was getting too heavy to be supported by the brush reinforcement.

A new development in wall construction was now brought forward. Going into the hills 60 or 80 miles away they cut cedar and juniper poles about 3 inches in diameter, brought them down the river and used them for core rods in place of the brush they had heretofore used. At once the wall thickness jumped to about 10 inches, because these new rods would sustain or support a much thicker wall than the smaller brush they had been using.

This improvement in wall construction must date back about 1,200 years.

When these people first came into the valley they probably lived a peaceful life, but later on other Indians came forward into their vacated hunting grounds and became a source of trouble. The hill people were hunters, which means a feast-and-fast sort of life, and in years when game was scarce they would turn on the valley people and raid the crops.

This gives us the reason for the many defensive means of fighting which we find the valley people had; the surrounding walls defending the various groups of houses; the small doorways where the enemy could enter only one man at a time and each man must enter in a defenseless position; the parapet on the roof behind which the defenders could stand or kneel, and so forth.

For many generations the hill people increased in numbers as fast as the valley people, and this raiding continued. During this period we must imagine a fairly steady loss year after year of a portion of the crops, but, on the whole, a loss which could be borne without serious injury.

The reaction of this warfare on the architecture is evident in the points noted above. With no enemies, the valley people might never have built a four-story building, for, as it was developed by them, it was not an economic success, costing, as it did, much more in labor and material than the same number of rooms would have cost in a one or two story house. It is an evident fact that the three and four story houses were built primarily for watch towers, although economy dictated that as many rooms as possible be arranged for living purposes so that the total investment of labor and material in the building might yield the greatest return in both peace and war times.

As watchtowers they must have proved a good investment, for from the top of the Casa Grande, which was four stories high, a guard could cover the country within a radius of approximately 10 miles. This was a great advantage over the one and two story houses, which gave a watching radius of only a mile or two. If the enemy could be sighted at 10 miles, he, being on foot, would need nearly two hours to get to the village, which gave time to get the runners out into the fields and gather the forces for defense.

The multistory house, however, had to await another type of wall development. Second and third stories could not be built with the reinforced type of wall. Sooner or later some one decided that the reinforcement, which was the expensive part of the construction, since the poles for it had to be brought from such a distance, could be left out and the wall could be made of mud alone, which was cheap and easy to obtain.

This was a far step, for it was only a matter of making thicker and thicker walls to evolve the two, three, and four story buildings, and they reached the last stage within about 300 years after the general introduction of the solid wall.

When the valley people were at their most prosperous stage there must have been not less than 8,000 and may have been as many as 15,000 of them in the Gila and Salt River Valleys. They farmed extensively, raising cotton and corn, made baskets and pottery of a good quality, used stone, wood, and bone tools, brought shells from the seashore to be used for decorations and ceremonies, and in general may be said to have lived in the late stages of the stone age. Thus far no useful metal implements have been found which can be attributed to them.

Some students can not understand why such an advanced people should have left the valleys and why later Indians have not settled in the villages and used the ditches of the older people. It is entirely possible and is indeed probable that the Apache Indian was the final cause of the abandonment of the country. If the Apaches swung into this southwest country 700 or 800 years ago from the Great Lakes region, they would have naturally joined hands with the hill tribes against these valley farmers and from that time or soon after we might see the beginning of the downfall of the valley civilization. They were not overcome in any single expedition nor in any single generation, but were gradually pushed out by the combined strength of the enemies. Year after year they lost a larger percentage of the crops and a larger number of warriors than they could afford to lose, until they finally decided to abandon the country.

There was probably no great exodus. It is more probable that a travel or hunting party would return to its village with reports of a good location at a safe distance where they might live unmolested, and the members of a clan or a part of the village would decide to move. Thus they were gradually dispersed, probably in several directions.

On this theory it is clear why when the houses were abandoned they were not reoccupied. The Apaches would not settle in them themselves nor would they allow anyone else to use them.

The houses and ditch systems gradually went to ruin, and later the Pima and Papago Indians came into the country. They were not far enough advanced to restore and occupy the ruins, but did visit them and remove some of the cedar and juniper timbers when they needed straight timbers for their own construction. This accounts for lack of roofing material in some of the rooms we have excavated. Other rooms stood until the rafters decayed and fell, and in excavating these rooms we find the rotted timbers on

the floors. Still other rooms stood until in some raid of the Apaches in recent times, say, in the last 500 years, they have been destroyed by fire, thus accounting for the burned rafters and roofing material we find in some of the rooms. After this final destruction by fire the dismantled walls stood until they were visited by Kino in 1694, at which time our later written history of them begins.

An appropriation of \$2,000 was made in the sundry civil act of March 2, 1889, which was used for excavation and repair work. Two thousand dollars was appropriated June 28, 1902, and expended in putting a protecting roof over the main building. Six thousand dollars was appropriated in 1906 and 1907 and expended in further excavation, at which time 100 rooms were opened. Since then no special appropriations have been made. Since the Casa Grande has been made a national monument our appropriations for the protection and repair of national monuments have been so small that no excavation and practically no repair work could be attempted.

It makes one sad to see a prehistoric monument like this one gradually disintegrating and to know that many others of our 24 monuments are in a like condition, all for lack of a few thousand dollars each year. Future generations will censure us greatly for our lack of interest and for not properly caring for and preserving for them these great relics of a long-vanished race.

TRAVEL.

Only since 1918 has a record of visitors been kept. Beginning our park year October 1 and closing it September 30, the attendance for the past two years, by months, has been as follows:

Yearly record of visitors.

Month.	1919		1920	
	Visitors.	Autos.	Visitors.	Autos.
October.....	195	110	465	199
November.....	146	101	432	169
December.....	169	85	470	168
January.....	344	133	481	178
February.....	387	135	695	218
March.....	388	173	806	247
April.....	445	194	965	302
May.....	376	178	1,169	412
June.....	383	162	597	309
July.....	217	153	520	341
August.....	264	152	533	318
September.....	363	138	587	421
Total.....	3,677	1,714	7,720	3,282

Considering that we are 20 miles from a main-line railroad, 75 miles from the nearest town of any size, and 10 miles from the nearest State highway, the fact that we more than doubled our number of visitors in the year just past is an indication that we have given satisfactory service, and well-pleased visitors have sent others out of the way to see our ruins. It should be remembered that at a monument no transportation company shows the visitor around. The custodian is in complete charge and must receive visitors, accompany them around, explaining and describing things they would otherwise overlook, see that no vandalism occurs, and in general act as host on behalf of the United States Government.

EL MORRO NATIONAL MONUMENT.

EVON Z. VOET, custodian, Ramah, N. Mex.

The past year has seen a wonderful increase in visitors to this monument, which is known locally as Inscription Rock. This increase is due to improvement of the roads in western New Mexico and to the newspaper publicity which the custodian has given the monument and its prominent visitors. Sunday seems to be the day which brings the greatest number of visitors, which come almost without exception in automobiles. Some days there have been over 100 persons who have visited the Rock, and the total number who entered the monument for the year is approximately 2,000.

Nearly all the travel comes in from Gallup, N. Mex., where a new Harvey House hotel offers the best accommodations on the railway, which is 50 miles distant from the monument. The Grants-Inscription Rock Road is used by a good many transcontinental tourists, but the Valencia County officials do not seem to appreciate the value of a well-signed road leading from Grants to the monument. This is still an unpeopled country, where the traveler goes sometimes a half day without seeing a soul, and then if a native is encountered the chances are very favorable that he can only give directions in Spanish or some Indian tongue. Thus many people prefer to enter the country from Gallup, along which route there is more travel, more frequent habitation, and a very fair road.

During the year the custodian has placed translations and historical notes under the principal inscriptions in a waterproof frame, to which he has added a warning sign against defacing the rock in any manner. This has led to a better understanding of the old inscriptions, which are in Spanish, and are unable to be read by many visitors without the help of the signs.

There have been several cases of persons scratching their names so near to old inscriptions that they are judged desecrations. The names and addresses of these parties have been reported to the Washington office and steps are being taken for their punishment.

It is of utmost importance to permanently protect these old messages by the heroic pioneers of this country, and it is hoped to do this before the end of the year 1920. The custodian during the year sent to the Bureau of Standards in Washington a large piece of the sandrock on which they are making experiments which will result in the perfection of a transparent substance which will absolutely protect the writings from any weathering away and save these historical messages for all time.

When this substance is ready for use, all modern names and initials which have been unthinkingly carved near the inscriptions should be chiseled out, so as to leave the surface of the monument perfectly smooth for a good margin around each old inscription.

This would tend to enhance the value of the inscriptions and would result in them being respected against any further name carvings.

The custodian is planning to have the spring at the base of the cliff walled with concrete in such a way that there will be a stream of fresh water there for the tourist at all times. Owing to the rush of water from rains which gather in the big basins on top of the mesa and then overflow with a great volume of water falling 250 feet below with great force, all previous efforts to repair the spring have been washed out.

During the fall the custodian marked the trail leading on top of the monolith, where there are two prehistoric Indian villages. Signs have been placed directing the public to these trails to the summit, from which a very wonderful view of the entire country can be enjoyed.

A few deer have been seen in the neighborhood of the monument, and quite a few bear have been killed in the Zuni Mountains, about 5 miles away. Local cattlemen have suffered from a pair of very ferocious wolves which killed numerous cattle. One owner, who lost upward of 20 head, had many more cows attacked and left tailless by the wolves, which bit the tails off close up to their bodies. The wolves were finally killed through the efforts of a local trapper and the Biological Survey.

Mary Roberts Rinehart visited the monument in September with a large party, under the direction of Howard Eaton, of Wolf, Wyo. The party traveled in seven automobiles and had three trucks in addition to carry their camp outfit and cooks. Mrs. Rinehart had taken in the Hopi snake dance northwest of Gallup and had telephoned the custodian, who accompanied the party to the monument. Mrs. Rinehart is preparing some articles on the Southwest, and was delighted with her visit here.

The custodian's ranch is getting to be the public camp ground of tourists, who seek the inviting shade of the piñon woods and good water in the home ranch well. This gives the custodian opportunity to get the signatures of visitors in the register, as well as to keep posted on the amount and kind of travel.

Neil M. Judd, of the United States National Museum, brought a party of scientists and writers, including Sylvanus Morley, of the Carnegie Institution; Earl H. Morris, American Museum of Natural History; and Charles Martin, head photographer of the National Geographic Society. Mr. Morley has in preparation an article on this part of the country, which will appear in the National Geographic Magazine and will include some pictures taken of the inscriptions of El Morro taken by Mr. Martin.

The monument, bearing as it does inscriptions as far back as 1606 of the Spanish pioneers, is looked upon as one of the most historical places in America, and the custodian is anxious to make the monument of enduring interest by protecting the writing from vandalism and by providing all information necessary to the constantly increasing visitors.

In this regard it is urged that a booklet be issued which will give photographs of the inscriptions and information fully covering the historical features of them. This booklet should contain a map of the roads around this part of the State and show the tourist the relation of El Morro to Hawaiku, Zuni, Hopi, Laguna, Acoma, Pueblo Bonita, Mesa Verde, and other places of interest to the traveler. The National Park Service should have such a book printed and published, and copies of it should be available for free distribution to all visitors to the monument.

MONTEZUMA CASTLE NATIONAL MONUMENT.

FRANK PINKLEY, temporary custodian, Blackwater, Ariz.

Montezuma Castle National Monument embraces 160 acres lying in sections 16 and 17, township 14 north, range 5 east, Gila and Salt River meridian, Arizona, and was created a national monument by presidential proclamation, dated December 8, 1906. The castle is situated about 3 miles northeast of Camp Verde, in the northeastern part of Yavapai County, Ariz.

The naming of this monument is unfortunate, since no connection has yet been established between this civilization and that of the Aztecs in Mexico.

This is a true cliff dwelling, in that it is built entirely in and considerably above the base of a cliff of tufa or volcanic ash. This cliff is composed of several strata of material laid nearly horizontal, and, being of varying degrees of hardness, they have, in eroding, produced many more or less deep recesses or hollows in the cliff. The largest of these recesses is now occupied by the Montezuma Castle, which was in all probability a communal living house, while many of the smaller recesses have been walled up and used for storage places or single family dwelling houses.

It needs no great stretch of the imagination when you are on the ground examining the ruins to see with your mind's eye that day, centuries ago, when some patriarch led his clan up or down this stream we now call Beaver Creek, and, upon rounding a bend, saw this cliff, prepared by nature for his protection. It meant safety and a degree of comfort, and the great bend formed at this point by the creek afforded ample ground for the cultivation of crops. Thus it was that the clan halted here, built in the cliff, and cultivated the land, living here for many generations. They finally left, either being pushed out by the growing strength of their enemies or they found a better land and decided to migrate to it, voluntarily abandoning their homes here.

The castle must have been among the last of the buildings erected in this district, because it represents the highest skill of the builders and took by far the greatest amount

of labor to build. We must remember that a primitive people settling in this valley would not have time to expend so much labor on a home at the beginning of the settlement. Their most important work was that which produced food, and so we might expect that the smaller and more rudely made dwellings would be made first. Only at some later time would large houses like the castle be built. This is exactly what has happened in our later settlement of this same country.

The castle itself was not all erected at one time, but shows at least three stages of building. Neither was it erected under the direction of one manager or foreman, for various different methods were used in the construction of the different rooms. The theory along which the facts check best is that it is a communal house and that each family or unit, in erecting its room or rooms, used its own methods applied with its best skill and judgment. There is such a wide difference in the plastering of various rooms, ceiling construction, wall and door construction, as to preclude any idea of specialization

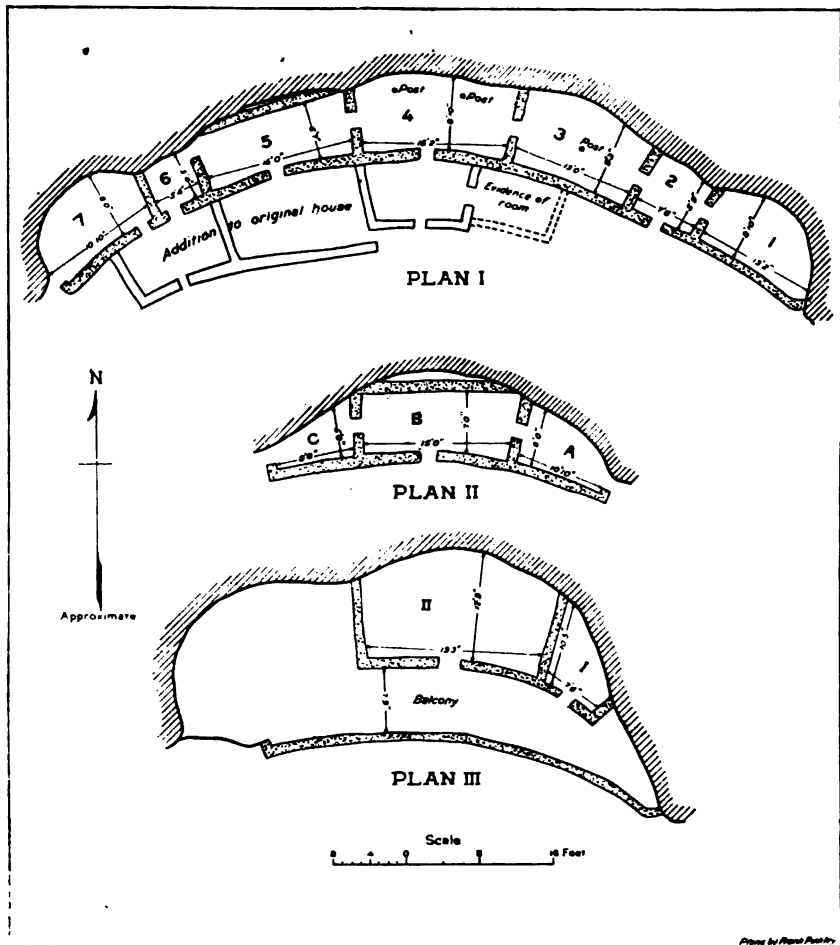


FIG. 5.—Sketch plans of Montezuma Castle, Montezuma National Monument, Ariz.

of industry. In those days each man was his own wall builder, plasterer, roofer, and interior decorator.

I should estimate the depth of the talus lying against the base of the cliff under the castle at about 30 feet. From the top of this talus to the first ledge is 22 feet, now covered by a well-constructed ladder. From this ledge to the second is 13 feet, and from the second to the third, where the foundation of the front and newer part of the castle is laid, is 16 feet, so that the foundation of the castle is approximately 81 feet above the bed of Beaver Creek. The building is approximately 40 feet from bottom to top and there is at least 30 feet of cliff overhead.

The sharpest division in the erection of the castle is between the front and back sections. The back section is, of course, the older, the front part probably being built when the increasing number of people made more house room a necessity.

The present entrance to the castle is through a restored doorway on the first floor level of the back section. To reach this one climbs about 8 feet up a ladder from the third ledge and enters room 2 of plan I. The present entrance is a restoration, but there was probably an original entrance to the right of the center of the room.

This room, as well as room 1 to the east, is now roofless, but was probably roofed originally by main beams running lengthwise of the rooms close to and parallel with the cliff. These main beams supported the rear ends of short rafters whose other ends were carried by the present front walls. These rafters in turn supported the brush and mud of the roof. The floor in this room is at present very rough, being the natural ledge rock, but was originally leveled with dirt, which has now been removed by curio seekers. The back wall of the room is the rough cliff, which pitches forward so much that the rafters needed to be only about half as long as the width of the floor. The walls are covered with smoke grime and the plastering shows many finger prints.

One enters room 1 to the eastward through a low door, now somewhat broken away but still showing the lintel sockets in the wall overhead. The front wall of this room is standing, higher than a man's head, and seems to be about as high as it ever was. The walls as well as the cliff at the back are smoke grimed and show many finger prints. The floor is now rough ledge rock, but was probably originally leveled with dirt as was that of room 2. The only opening in the outer wall is one "peephole" to the right of the center of the room about 1 foot above the floor. It is about 4 inches square and angles downward, covering a small field near where the cliff and talus meet.

Coming back through room 2, we enter room 3 by creeping through a low doorway whose sides are not perpendicular but taper inward toward the bottom.

The outer wall of this room stands complete, with no openings. Its curve is rather pronounced, the whole building being built somewhat in the shape of a crescent, with its concave side facing outward. The walls of this room are covered thickly with finger prints and there is much smoke grime. About midway of the room on the south wall and close to the floor an intentional decorative wavy design, about 2 feet square, has been drawn in the soft plaster with the tips of three fingers. The main beam and rafters of this room are intact, but the reeds and other roofing material are practically all gone. The main beam runs from over the south side of the east door to a point over the north side of the west door. This beam supported the back end of the rafters, whose front ends ran into the front wall. The beam is of one log about 8 inches in diameter, but the weight of the floor above cracked it and a supporting post was introduced during the period of habitation of the building. In recent bracing work a 6-inch pine post has been set beside the ancient one.

The floor is original rock of the ledge in the back half of the room. The front wall continues downward about 4 feet below the floor level and acts as a retaining wall to hold an earth fill in the front part of the room.

Rooms 1, 2, and 3 had floors on practically the same level, but there is a rise of about 15 inches to the floor in room 4. The visitor here sees, for the first time since entering the building, a drop-center doorway, if we may coin a term to describe it. It is shaped as though the doorway proper had been made about 8 inches above the level of the floor and the middle part of the threshold had been cut down to the floor level. This dropped center is only wide enough to pass the feet through one at a time, but the doorway proper admits the stooping body easily enough.

The ceiling, walls, and openings in this room are intact, with the exception of the doorway in the south side, which is somewhat broken. The room is celled by two main beams running from north to south, their outer ends bedded in and running through the wall, the inner ends not attached to the cliff, but carried on posts. These timbers are all about 9 or 10 inches in diameter.

On top of these beams, rafters about 3 inches in diameter, spaced about 10 inches, center to center, run the long way of the room. Across these rafters and parallel to the main beams is a layer of small brush about one-half inch in diameter. Above this layer of brush runs a layer of large grass stems transversely or parallel with the rafters. A thick layer of dirt or mud was then put on, and this forms the floor of the room above.

In this room for the first time we see that the roughness of the cliff wall has been smoothed up near its base by a false wall of mud and rocks, now broken away by vandals. Here, too, we get for the first time what might be called the drop-center floor. The floor seems to have been laid in three sections marked or divided by the two posts which support the roof. The east and west sections are several inches higher than the central section, but the whole floor is now pretty badly broken. No construction reason can be assigned for this effect.

In going from room 4 to room 5, one goes through a drop-center door and steps down over 2 feet to the new floor level.

This room shows the same drop-center floor we have noticed in the preceding room, but this one is in better condition. The south door has the drop-center effect. The west door is broken away. Original lintels are over the east and south doors. The walls are very black, but show less finger prints than usual. Even more care has been taken with the cliff side than in the preceding room. A false wall has been built up to the roof, except at the west upper part where the cliff projects within the line of the wall. Two storage pockets have been made on the level of the floor in this back wall. The roof construction in this room is very interesting. Four main beams about 10 inches in diameter are laid from north to south. The outer ends of these beams are carried by the wall through which they run. The inner end of the west beam has been sunk in a hole in the cliff which, as stated above, projects into the room at this point. The ends of the other beams are carried on the back wall.

The rafters were about 2½ inches in diameter and were laid as closely as possible on top of the beams running lengthwise of the room. A ceiling was then put in under these rafters. It consists of a layer of reeds about the size of pipestems, laid closely together and held by upper and under cross rods about the size of a pencil and spaced about 10 inches apart. These cross rods were tied through the layer of reeds with yucca bands and the upper rods were tied to the rafters. Thus the room had the appearance of being celled with the small reeds which covered all the other construction except the main beams. It is a purely decorative matter, as it served no constructive purpose whatever.

On top of the rafters, which ran east and west, bunches of grass were laid pointing north and south, and on top of this came the dirt of the floor above.

A wall pocket and shelf occur in the back wall, the shelf being left near the west end in building the wall. The pocket occurs close to the ceiling near one of the main beams.

The floor of room 6 is about 1 foot below that of room 5. This room is small and very roughly plastered. It is only about 3 feet 6 inches high, and the walls and ceiling are smoke grimed. There may have been a door through the south wall which was used for a time and then blocked up. This south wall is now broken down to a height of about 2 feet.

Room 7 has its floor on the same level with room 6. The floor here is of the ledge rock and the back wall is the rough cliff. Both doors are drop-center and the western one leads out on a small ledge of the cliff.

Two "peepholes" occur in this room, one about the center of the front wall near the ceiling looking upward, covering the edge of the cliff above, the other, pointing downward, is near the southwest corner and covers the talus at the bottom of the cliff. A possible third hole near the floor is now blocked by later construction in front.

This completes a description of the rooms on this floor in the original building.

The newer part of the building has been built four rooms in length and from one to three stories high, running from the center of room 3, as above described, to about the center of room 7.

Being in front of the older part, whose foundations were even with the front of the upper or fourth ledge, these rooms were founded on the next or third ledge, which projects far enough to carry the width of the new part. This ledge is some feet lower and the floors of the old and new part are not on the same level, though the levels are not so far apart as to preclude going from the old part down into the new. Instead of using the foundation walls of the new part as retaining walls and leveling the floors of the first story of this part by an earth fill they seem to have put in a pole floor and left a small space beneath which may have been used for storage. The lower line of this newer section seems to have been composed of four rooms. The upper line was of three rooms, making seven in the new part as a whole. They are now in very bad condition because by their location, being set farther out, they have been more exposed to the elements and the walls have been badly eroded.

Returning to room 3, the visitor can climb to the second tier of rooms in the older section of the building by a ladder which has been placed in recent years and thus get into room A on the second floor.

This room is almost triangular in shape, being only wide enough at the east end to have a doorway between the front wall and the cliff. The cliff, pitching forward as it does on this level, makes all three rooms of this floor narrower than those on the floor below.

I am inclined to think that the east door of this room A was the original entrance to this story, admission being gained by coming up an outside ladder. I have found no evidence of an inside ladder hole connecting the first and second stories. It will be noticed on Plan II that room A is about 3 feet shorter than room 3 below. This is because the overhanging cliff comes in so close as to shut off further construction at this point.

The door at the east end of the room shows a good lintel still intact. Of the floor, only the rafters and main beam remain intact, but enough floor material remains to say it was made of a layer of brush laid on the rafters and this was covered with several inches of mud. There is much smoke on the walls of the room, but not many finger prints in the plaster.

There is a rise of 2 feet from the floor of room A to the floor of room B through a doorway which is in an excellent state of preservation, having a rock slab for a threshold and not the drop-center effect we observed on the floor below.

In room B the walls are in good condition with not quite so much smoke nor so many finger prints in the plaster as is usual. A back wall has been built in this room hiding the cliff—probably to carry the wall of room II in the story above.

For some reason this wall is carried for about six feet near its center on three logs. These logs are about 10 inches above the floor and the space beneath was once walled up but has been broken open by vandals and exposes a pocket in the cliff behind the wall.

The west door of the room is in fair condition, with good lintel and sills. It appears to have been a drop-center door but is in such condition that we can not be sure. The roof consists of two main beams about 12 inches in diameter, crossing from the front to the back walls. Over these, the rafters, about 4 inches in diameter, are carried lengthwise of the room and they are crossed by reeds about one-third inch in diameter carefully laid. These are crossed in turn by bunches of grass, and mud is laid on top forming the floor above.

There is a place in the ceiling of this room at the north side slightly east of the center where an old ladder hole has been closed up by sticks about 1½ inches in diameter laid lengthwise on top of the layer of reeds. No reason is apparent why it should have been closed.

Room C is almost triangular in shape, made so by the line of the cliff at the back. There is much smoke and many finger prints on the walls. A west door leads out on a little rock ledge.

The roof rafters are about 4 inches in diameter laid from front to back and crossed by reeds about one-half inch in diameter, with about 8 inches of mud packed on top.

The present ladder leads up to the next floor from this room.

The upper story may be described as consisting of two rooms and a balcony. The front of the balcony is protected by a parapet about 4 feet high, which is a continuation of the front wall of the lower stories. This parapet served the double purpose of preventing anyone accidentally falling overboard and in war times was a very useful means of defense.

The parapet is punctured by four small holes, which are supposed to have been port-holes, though they can hardly have been useful for such a purpose in the days of bows and arrows.

The balcony, as plan III shows, was large enough to accommodate quite a number of people in comfort either in peace or war times. The cliff has quite a recess on this level so that while the balcony in front of the rooms is made of the roof of the rooms below at its western end it runs back into the rock of the cliff. This part in the cliff is raised about 18 inches above the rest and a smooth mud floor, part of which still shows, was laid on this raised part.

Room I was built after room II, as is shown by the bonding of the walls. The doorway of this room is now badly broken down. The interior walls show comparatively few finger prints and much more cracking or checking of the plaster. Either a different material was used for this plaster or the material received a different treatment.

There is a small opening near the cliff in the wall between rooms I and II. This opening is too small to have been used for a door and so far no satisfactory explanation has been offered for it.

The doorway of room II is broken down. The inside plaster of this room is in bad condition. I think the room was sealed when the original inhabitant left and bats went through a couple of holes in the walls and used the room for a breeding place for generations. There is evidence of a storage closet in the right-hand corner back next the cliff. It has been nearly destroyed by vandals.

A small hole of the so-called "peep" variety runs through the west wall of this room, but its angle is such that only a few square feet of the balcony outside can be observed through it.

The cliff overhangs these two rooms and the balcony and projects some 10 or 12 feet beyond the parapet.

Visitors must make a rather circuitous climb to get to the castle, and we at one time considered cutting a shaft down through this overhanging cliff from the mesa above so that visitors might come directly down from the road on the mesa, which is not far away, to the balcony of the castle. The plan had to be abandoned because the weakened condition of some of the walls precluded the use of the blasting operations necessary to get the shaft through the solid rock overhead.

Near the castle are many smaller structures of from one to four or five rooms and 200 or 300 persons may have had their homes in this vicinity. They used pottery of a fair quality, some of it being decorated in two-color work with symmetrical designs. They also made coiled and impressed pottery. They raised corn and were in a fairly well-advanced stage of the stone age and depended for their living partly on agriculture and partly on hunting. They had enemies who strove to steal their crops and to kill them, and it is entirely probable these enemies finally overcame them to the point where they became discouraged and moved on to other places where they would not be harassed.

ADMINISTRATION.

Owing to a distressing lack of funds for the protection and upkeep of the national monuments during the past year there is practically no report to make on the Montezuma Castle National Monument. In September, 1919, acting under your orders, I made an inspection trip to the castle and reported the need of some trail and protective drainage work, amounting in all to about \$400, but we had no funds, so nothing could be done and the matter had to go over.

During the next fiscal year we hope to get trails cleared out and built so that visitors may get from the present camping ground, which is some half mile away, to the castle with some safety and comfort. Another trail should be opened from the castle up to the mesa over the cliff so that visitors may be able to get to the castle during the times of high water in Beaver Creek when the lower trail will be cut off at one point.

Some local man should also be appointed as custodian to reside on the ground and receive visitors and prevent the brainless kind of vandalism which scratches names over the walls and whittles off pieces of wood for souvenirs. If people could get an intelligent idea of this ruin from a well-informed custodian, I am sure we could double the number of visitors in a year by sending merely curious persons away as interested boosters. This would take an outlay of \$2,000 per year for the custodian's salary and a small repair fund, and so we will not be able to do it as long as we are limited to an \$8,000 appropriation, which must cover all repair, upkeep, and administration charges on 24 monuments, about half of them needing a custodian just as badly as this one.

MUIR WOODS NATIONAL MONUMENT.

ANDREW LIND, custodian, Sausalito, Calif.

No work has been done in the park this year, with the exception of the erection of three small log buildings for the convenience of the public.

The automobile road through the park was graveled in 1919 and is still in good condition. There has been talk of excluding automobiles from the park, and Mr. William Kent offered to set aside an area for parking on his property just outside the monument within easy walking distance of the park, but as yet this plan has not been put into effect, and automobiles are allowed the privilege of driving through and stopping inside the monument.

The trails have been kept clean and free from brush, and footbridges, rustic tables, etc., in a good state of repair.

This year a greater number of deer have been observed in the park than during previous years, and a doe with her fawn coming to the creek to drink is a not infrequent sight in the early morning or evening.

Gray squirrels have been gradually diminishing in the monument the last few years and are now rarely seen.

The picnic grounds are thickly infested with blue jay, which become very tame.

Coyote and coons and a few quail also inhabit the park.

Traffic through the monument from October, 1918, to October this year has been very heavy, approximately 77,577 people visiting the park during the season, 25,077 entering the park via the Mount Tamalpais and Muir Woods Scenic Railway, approximately 2,500 by automobile via the automobile road from Mill Valley, a distance of only 4 miles, and approximately 50,000 "hikers" and picnickers walking over the road and trails. Several very large picnic parties during the season tended to greatly increase the approximate number of people entering the park on foot. On one occasion a San Francisco newspaper arranged a picnic in the park, the attendance at which was about 8,000.

A cottage or cabin for the custodian, to be erected within the monument, is especially recommended. The present cabin, on ground belonging to Mr. William Kent, outside the monument, is in condition beyond repair and hardly habitable. A cabin erected within the monument would be a great convenience for the custodian.

NATURAL BRIDGES NATIONAL MONUMENT.

HOW THE BRIDGES GOT THEIR NAMES.

The two larger bridges were named in 1903 "Augusta" and "Caroline" by Horace J. Long and James Scourup for their wives, the smaller bridge being then known as "Little Bridge." In 1906 Col. Edwin F. Homes sent a party to the bridges to secure additional data. This party adopted the other names and named the smaller bridge "Edwin."

When a request was made to have these natural bridges declared a national monument William B. Douglass, United States examiner of surveys, was sent to investigate their fitness. He was further instructed to learn and report their Indian names. Mr. Douglass succeeded in finding a Paiute Indian, "Mike," who was born at the bridges, and whose father had spent much of his life there. The bridges were known by a general term meaning "the space under a horse's belly between his fore and hind legs," but they had no individual names.

Investigation of the bridges showed them to have been the homes of a prehistoric people, who had carved upon the second bridge, "Caroline," a symbol recognized as that of the Kachina, the sacred dancers of the Hopi Indians. Thus this bridge was named in prehistoric times Kachina (the bridge of the sacred dancers).

This led to the use of the Hopi language for the other names. In this Mr. Douglass was aided by Dr. Walter Hough, curator of ethnology, United States National Museum. On the largest bridge a gigantic formation resembled a draped bier, suggesting for it the name Sipapu (the portal of life).¹

The little bridge was named Owachomo (the rock mound bridge) from the conical rock mound seen upon it.

These names were recommended to the United States Board on Geographic Names, which approved them as the names of the bridges.

NAVAJO NATIONAL MONUMENT.

JOHN WETHERILL, custodian, Kayenta, Ariz.

Conditions within this monument have been fairly good throughout the year, although a lack of rain during the summer has made feed rather short in places.

There has been a greater number of persons visit the ruins and the Rainbow Bridge this season than ever before, a total of 64 persons having made the trip.

Among these was Prof. Byron Cummings, of the University of Arizona, who conducted a summer class in archaeology. He also did considerable excavating in the ruins. Several very interesting finds were made, which will be on exhibit at the State museum shortly.

Prof. S. J. Gurnsey, of the Peabody Museum, Cambridge, Mass., also did some work in the ruins and canyons lying in the monument. He secured a small collection, which will be added to the already large collection from this country on exhibit at the Peabody Museum. Frances McComas, a well-known landscape painter of the Southwest, made an extended stay at the ruins sketching, preparatory to making an exhibit in New York the coming winter, of his work in the Southwest.

Emery Kopta, the Indian sculptor, also made some sketches and measurements preparatory to work he intends doing later.

All visitors to the ruins are high in praise of the restoration work done by Nell Judd in 1917 on Betata Kin, saying it is the finest piece of work of this kind they have ever seen.

The great need for this monument is an appropriation for road and trail work. Mr. S. J. Gurnsey lost a quantity of unreplaceable plates and films taken of his work in the monument owing to the bad condition of a part of the trail. The pack animal bearing this material was mired down at one of the crossings, the water damaging the entire pack.

Recently good-road pathfinders came through looking up a practicable route to connect the Spanish Old Trails with the National Highway at the Grand Canyon. On their return they were very enthusiastic over the possibilities of linking up the Mesa Verde National Park, the Navajo Monument, and the Grand Canyon National Park with an auto road. These gentlemen consider the route very practicable and that it can be put in good condition at a reasonable cost. The building of this road would open to auto travelers a road through the greatest scenery in the Southwest.

PAPAGO SAGUARO NATIONAL MONUMENT.

J. E. McCLAIN, custodian, Tempe, Ariz.

My report for the past year is something of a removal report, since I have removed two families, with their dwellings, from the national monument. They both stated they did not know they were on the national monument.

I have removed two different bands of sheep that were in the habit of grazing each spring within the monument boundaries, and many small bands of cattle and horses from grazing within the monument. All commercial signs, which amounted to something over 100, have been taken down.

I have met with two local committees. One with regard to locating a landing field for airplanes, the other, representing the Salt River Valley Water Users' Association, wishes to establish what would be known as Reclamation Park; this section is, as you know, under the Roosevelt Dam. They will probably ask in the near future that approximately 20 acres within the boundaries of the national monument be set aside as an irrigation park.

¹All Pueblo Indians believe they came into this world from the lower world through a hole or opening, called by the Hopi, "Sipapu." After death, they return through the opening to the lower world, where they remain a period before going to the sky to become "rain gods."

If these can be located and the improvements made without marring the beauty of the monument or destroying any of the fine cacti gardens, I will be only too pleased to recommend them. There is part of the monument that has practically no desirable growth of vegetation located thereon, that it would be well to improve, with a landing field for airplanes; also there is some land that could be well improved from the water now flowing through it that is controlled by the Salt River Valley Water Users' Association, and I see no reason why they should not select this part of the monument for their improvement.

IMPROVEMENT NEEDS.

First, we need to resurvey the boundary line and establish the same with permanent monuments. I would recommend a cement post about 4 by 6 inches by 4 feet long, placing them 2 feet in the ground, and about one-eighth of a mile apart.

Second, I would recommend that the park service spend at least \$2,000 annually on the building and maintaining of roads leading from the cement state highway that passes through the monument. It is estimated that 50,000 people traveled over this road, and that only about 5,000 of these visited the monument, but more would do so if the trails that now wind around through the monument were improved to make motoring more enjoyable and safer. At the present time when we have a heavy rain-storm the small washes on these trails become rather dangerous.

PETRIFIED FOREST NATIONAL MONUMENT.

WILLIAM NELSON, custodian, Adamana, Ariz.

The Petrified Forest, set aside as a national monument in 1906 and reduced to its present size in 1911, is located in Apache and Navajo Counties of Arizona and comprises about 25,000 acres of ground more or less covered or studded with fossilized wood, some of which has assumed the most brilliant colors, while some, instead of coloring, exhibits a remarkably well-preserved grain.

CONDITION OF ROADS.

The roads within the monument have been improved to some extent, inasmuch as an allotment of \$500 has been used to render the road between the Second and Third Forests passable to auto traffic. This sum, however, was not sufficient to establish a thoroughly satisfactory road, but it is expected that the 1921 allotment will put this stretch in good condition.

ACCESSIBILITY.

The monument is generally accessible during the entire year, exceptions due to high water or quick sand in the Rio Puerco rendering this stream impassable.

Tourists traveling by rail will find at Adamana auto stages making daily trips to the most attractive and interesting points in the forests; a hotel furnishes accommodations.

Auto tourists traveling on the National Old Trails Highway (Albuquerque-Gallup-Holbrook) can detour at Adamana and traverse the monument, striking the St. Johns-Holbrook Road in the Third Forest and the National Old Trails Road again at Holbrook; while the ones going over the Albuquerque-Springerville-Holbrook Road will pass through some of the Third Forest without making a detour.

TRAVEL.

Travel to the monument has broken all records this season, totaling 80,390 visitors. Of these 23,898 came in 7,966 private automobiles, and 6,592 people travelling by rail were transported to the monument by stage line from Adamana.

IMPROVEMENTS PLANNED.

An allotment of \$1,050 for the coming season has been granted, and of this, \$1,000 will be expended in general road work, the balance for painting the concrete support under the Natural Bridge tree, for excavating the still buried top of this tree, and for signs at all forks of roads.

FUTURE NEEDS.

The most conspicuous need of the monument is a bridge across the Rio Puerco near Adamana, to make the forest accessible at all times. Furthermore, as increased auto traffic brings a likewise increasing element of vandalism, a better protection for the monument in the form of patrolling rangers is earnestly recommended.

RAINBOW BRIDGE NATIONAL MONUMENT.

THE DISCOVERY OF THE GREAT RAINBOW NATURAL BRIDGE.

[Facts taken from the report of W. B. Douglass, United States examiner of surveys, to the Commissioner of the General Land Office, May, 1910.]

The discovery of the great Rainbow Natural Bridge may be said to date from October 7, 1908, when William B. Douglass, an examiner of surveys of the General Land Office, reported its existence and location to the commissioner and asked authority to segregate it as a national monument, which was granted under date of October 20, 1908.

The information had come to Mr. Douglass from Palute Indian, "Mike's Boy," who later took the name of "Jim," employed as flagman in the survey of the three great natural bridges of White Canyon. Seeing the white man's appreciation of this form

of wind and water erosion, Jim told of a greater bridge known only to himself and one other Indian, located on the north side of the Navajo Mountain, in the Palute Indian Reservation. Bending a twig of willow in rainbow shape, with its ends stuck in the ground, Jim showed what his bridge looked like.

An effort was made to reach the bridge in December. Unfortunately Jim could not be located. On reaching the Navajo trading post, Oljato, nothing was known of such a bridge, and the truth of Jim's statements was questioned.

The trip was abandoned until August of the following year, when Mr. Douglass organized a second party at Bluff, Utah, and under Jim's guidance left for the bridge. At Oljato the party was augmented by Prof. Cummings and a party of college students, with John Weatherill as packer, who were excavating ruins in the Navajo Indian Reservation. As the uninhabited and unknown country of the bridge was reached, travel became almost impossible. All equipment, save what was absolutely indispensable, was discarded. The whole country was a maze of box canyons, as though some turbulent sea had suddenly solidified in rock. Only at a few favored points could the canyon walls be scaled even by man, and still fewer where a horse might clamber. In the sloping sandstone ledges footholds for the horses must be cut, and even then they fell until their loss seemed certain. After many adventures the party arrived at 11 o'clock a. m., August 14, 1909.

Jim had indeed made good. Silhouetted against a turquoise sky was an arch of rainbow shape, so delicately proportioned that it seemed as if some great sculptor had hewn it from the rock. Its span of 270 feet bridged a stream of clear, sparkling water that flowed 310 feet below its crest. The world's greatest natural bridge had been found as Jim had described it. Beneath it an ancient altar bore witness to the fact that it was a sacred shrine of those archaic people, the builders of the weird and mysterious cliff castles seen in the Navajo National Monument.

The crest of the bridge was reached by Mr. Douglass and his three assistants, John R. English, Jean F. Rogerson, and Daniel Perkins, by lowering themselves with ropes to the south abutment and climbing its arch. Probably the first human beings to reach it.

No Indian name for the bridge was known, except such descriptive generic terms as the Palute "The space under a horse's belly between its fore and hind legs," or the "Hole in the rock" (nonnezoshi) of the Navajo, neither of which was deemed appropriate. While the question of a name was still being debated, there appeared in the sky, as if in answer, a beautiful rainbow, the "Barahoni" of the Paiutes. The suitability of the name was further demonstrated by a superstition of the Navajos. On the occasion of his second visit, the fall of the same year, Mr. Douglass had as an assistant an old Navajo Indian named White Horse, who, after passing under the bridge, would not return, but climbed laboriously around its end. On being pressed for an explanation, he would arch his hand, and through it squint at the sun, solemnly shaking his head. Later, through the assistance of Mrs. John Weatherill, an experienced Navajo linguist, Mr. Douglass learned that the foundations of the type of the bridge was symbolic rainbows, or the sun's path, and one passing under could not return, under penalty of death, without the utterance of a certain prayer, which White Horse had forgotten. The aged Navajo informant would not reveal the prayer for fear of the "Lightning Snake."

An interesting and graphic description of the bridge and the difficulties to be encountered in reaching it is from the virile pen of the late Theodore Roosevelt as published in the Outlook. To the hardened rider a trip that commends itself for its many points of interest is to leave the Denver & Rio Grande train at Mancos, visit the Mesa Verde National Park, take the stage at Cortez, Colo., for Bluff, Utah, passing along an interesting ruin-lined road. At Bluff guides and pack outfit may be had, not only for the great Rainbow Bridge, but for the Natural Bridges National Monument as well. To the Rainbow Bridge the trail passes through the most beautiful forms of wind-sculptured rocks, an everchanging panorama of wonderful views. The cliff-castle ruins of the Navajo National Monument may also be visited, and the trip terminated at Grand Canyon, where the railroad is again reached.

SCOTTS BLUFF NATIONAL MONUMENT.

WILL M. MAUPIN, custodian, Gering, Nebr.

Scotts Bluff, in Scotts Bluff County, Nebr., was set apart as a national monument by presidential proclamation of December 12, 1919. In April, 1920, I was appointed custodian of the monument, receiving my commission on April 9.

Scotts Bluff National Monument embraces a tract of 2,053.83 acres, which includes the highest known point within the State. It includes historic Mitchell Pass, through which was the route of the old Oregon Trail and which is now marked by an "Oregon Trail" monument set up by the Nebraska State Historical Society. It includes also a major portion of Dome Rock, a landmark of unusual beauty. A goodly portion of the acreage embraced within the monument grounds is good grazing land and might well be leased for grazing purposes without in any wise detracting from its merits as a resort.

Neither before nor since the designation of this beautiful tract as a national monument has there been any attempt made to improve it. For many years it has been a favorite resort of the people living in its immediate vicinity, and a trail to the summit has been made by the countless thousands who have climbed thereto. Shortly after my appointment as custodian a party of Boy Scouts from Gering and Scottsbluff, acting under my direction, greatly improved the pathway to the summit, cutting some new steps in the sandstone and smoothing many rough places on the lower stretches. Apart from this one thing, there has been nothing done in the way of improvements.

With the rapid settlement of the surrounding country and with constantly increasing facilities for travel, Scotts Bluff National Monument is becoming more and more a scenic resort, and with proper development and advertising will in a comparatively short time become one of the most popular scenic resorts in the entire West. It is on the direct line of tourist travel between the East and West just as soon as the present system of Federal-aid roads is completed, and which is now well underway.

As custodian I hereby make the following recommendations:

There being no adequate appropriation for the improvement of the national monuments, I recommend that a concession be granted to a responsible man or corporation to con-

struct and operate an automobile toll road from any feasible point within the monument's limits to the summit thereof, with the privilege of conducting an amusement resort on the summit, subject to rules and regulations to be made by the National Park Service. Such a road and amusement resort would immediately popularize the monument attract many thousands of tourists, and afford a summer resort that would be of immense benefit to thousands who are not now able to travel long distances at the expenditure of considerable money and the loss of valuable time to enjoy a summer outing. This recommendation, if given official sanction, would result in the beautification of the monument grounds without expense to the park service.

I would further recommend the leasing of that portion of the monument acreage included in the so-called Bad Lands to some reliable individual or corporation to be used for grazing purposes only. Provided, that in the fencing of such portion adequate provisions be made for the convenience and safety of tourists; that this lease include the fencing of the leased lands, and that said lease be for a period of not less than three years at a rental of not less than 25 cents per acre per year.

I would further recommend that the short stretch of road through Mitchell Pass, and which has been a public road for more than 50 years, be improved in keeping with its historic value and made to conform to the roads now provided in other national parks and monuments. This roadway extends for about 1½ miles through the monument grounds and is the most difficult bit of road approaching and through Mitchell Pass, and is the most expensive piece of road, being largely through a rock formation that will necessitate expend a considerable amount of money on permanent improvement of the public highway approaching this portion of the Government's property on either side, provided the service will make permanent improvement of the road within the monument limits. I earnestly recommend that this important work of improvement be undertaken at once and completed without undue delay.

There being no inclosure of the monument grounds, and it being approachable from many directions, there is no possible way of securing even an approximate estimate of the number of tourist visitors. It can only be said that during the summer months numerous picnic parties and casual visitors may be seen upon the monument grounds every day, and particularly is this true of Sundays. It is safe to say, however, that between April 15 and October 15 of each year not less than 2,500 people climb to the summit of Scotts Bluff and 5,000 or more people visit and picnic upon its slopes.

TUMACACORI MISSION NATIONAL MONUMENT.

FRANK PINKLEY, custodian, Blackwater, Ariz.

The location of the present Tumacacori Mission was first visited by Father Kino in 1691. From this time we can date the beginning of the more or less irregular visits of the Jesuit Fathers, which continued through the next 10 years. In 1701 Father Juan de San Martin was given charge of the three new pueblos of San Gabriel de Guevavi (the present Guevavi), San Gayetano, now Tumacacori), and San Luys (afterwards abandoned and the site now lost). After mentioning this event, Father Kino, in his diary, continues:

"In all places buildings were constructed, and very good beginnings were made in spiritual and temporal matters. In Guevavi in a few months we finished a house and a church, small but neat, and we laid the foundations of a church and a large house."

Father Juan seems to have lived at Guevavi and visited the other two pueblos when services were to be held there.

A room or house in which to hold services had been in use at Tumacacori for several years and probably served several years after the appointment of Father Juan. Another building was probably erected about 1730, when Father Juan Baptista Grasshofer came to administer the affairs of the church. It was this second building which was attacked by the Apaches in 1769 and was almost in ruins in 1772. It was repaired in 1784, and Bancroft says it had become the headquarters of the father by that time. This building was roofed in 1791 and may have been destroyed in one of the Indian raids subsequent to 1800.

The walls of the present Tumacacori Mission were still incomplete in 1822, and the building was not entirely finished when it was abandoned, two or three years later. It remained in a ruined condition, without care, until it was made a national monument by a proclamation dated September 15, 1908, since which time it has been more or less cared for by the Department of the Interior as well as the meager funds would permit. It came under the newly organized National Park Service in 1917 and was placed under my direct charge in the latter part of 1918.

We were able to do some restoration work in 1919, a detailed report of which was made to you and included in the Third Annual Report of the National Park Service. At present we are marking time in the administration of this monument. We are striving as best we can to stop the constant disintegration which has been and is yet taking place. We have plans under way and hope to be able to roof the nave of the church within the next year. Restoration, except in absolutely necessary places, is not yet to be considered, for our funds have been and are yet so small that every dollar spent must be used to stop the forces of destruction. To accomplish the work so far done, our appropriations have been so small that we have had to appeal for local aid, and no report on the mission is complete unless it expresses due appreciation of the financial aid and great interest given and expressed by the University of Arizona and the chambers of commerce and local organizations of Tucson and Nogales.

The National Park Service should develop a complete plan or scheme of handling its national monuments. At present we are feeling our way from one year to another and not making the progress we should make if we laid out and worked for a scheme which might cover a series of years.

In the historic monuments, of which the Tumacacori is one, the most immediate and important thing is, of course, to stop disintegration. For any landlord to try to make greater returns from his building by stopping all repair and protection investments and carry the amounts thus saved to his profit account would be called sheer folly. Yet this seems to be the idea behind the plan of holding our appropriations to an average of \$300 to \$400 per monument per year. With this amount we can stop the destruction of neither the elements which are trying to wear down and undermine our walls nor of

the ever present human vandal who is as constantly trying to write his precious name upon and tear down and carry away parts of our monuments as souvenirs. For defensive purposes against these enemies of our monuments an average of at least \$1,000 per monument per year should be provided. This would almost enable us to check destruction.

But acting as a guard or watchman is only the beginning of our duties. We must teach the people to know what their monuments mean. To simply stand as guards over the historic monuments and allow curious visitors to come and gaze in wonder and depart without information, is not to deliver the service which we advertise in the name of our organization.

These visitors should be at least partly prepared to enjoy our monuments by explanatory literature put in their hands before they come. We do this with well-illustrated booklets for our parks, but we do it but poorly for our monuments.

Having advertised our monument and brought our visitor to it, we should give him detailed information while he is there. This is the real business of a custodian. He is there, or should be there if our appropriation would permit, to act as host on behalf of the United States Government, to receive the visitor and make him feel that this is his monument, to give him all the information and history concerning it, to show its proper relation to the history and development of that part of our country.

During the year how many visitors can wander around the walls of our Tumacacori Mission for half an hour without the services of a custodian and go away with any conception of the circumstances which caused the building of this line of missions, of which our Tumacacori is one unit, up into Arizona? How many of them can understand the conditions under which the early fathers worked in erecting buildings of such magnitude in such a frontier country and with such labor as they had available? Yet we fall to fulfill our duty if he goes away without a real comprehension of the causes and currents of history and exploration which led to the building of these missions.

RECOMMENDATIONS.

We should have a custodian residing at the Tumacacori Mission who could devote his whole time to that monument. He should look after the grounds, see that no vandalism occurs, see that visitors are properly received and cared for, and he should be informed not only on this mission but on all the others in southern Arizona and those connected with them across the border in Mexico. Then, instead of spending an idle hour at our mission, which he may soon forget, the visitor will stay a day, and before he leaves the country will visit the other missions and take away an intelligent impression of the early history of this part of his country.

We should have a reasonable amount per year for repairs and some needed restoration. Any amount invested will bring its return in increased interest and an increased number of visitors per year.

We should have a reasonable amount for parking our grounds and preparing a place where visitors may be comfortable among pleasant surroundings.

These things can not be done until the appropriation is increased to an average of \$1,500 per year per monument for the national monuments under our service.

REPORT OF THE LANDSCAPE ENGINEER.

CHARLES P. PUNCHARD, Jr., landscape engineer.

In submitting this second annual report as landscape engineer of the National Park Service, which covers the fiscal year just ended, it is gratifying in reviewing the work of the past year to note the healthy progress which has been made, both in interest and actual accomplishments.

The demands upon this division of the bureau have more than doubled, and it has been somewhat difficult at times to give immediate attention and the proper amount of study and thought to the problems involved without causing serious delay and interfering with the progress of developments.

It is the intention of this division to give each problem due consideration and study, both as to its relation to and effect upon the whole, and as an individual unit. Flash opinions are to be avoided, for sooner or later they invariably lead to complications which are to be regretted.

The past year has been one of unusual activity in the national parks, and it has been necessary for concessionaires to meet an immediate demand for improvements, addition to equipment, and housing facilities at comparatively short notice. This condition has made it necessary in some cases to approve the erection of temporary buildings and the installation of temporary housing and sanitary facilities in order to give the tourists the necessary accommodations and comforts.

Although the approval of temporary structures is contrary to the standards which the service is endeavoring to establish and promote, the tremendous demands made upon existing facilities has made it necessary to deviate in some cases from this policy. However, such deviations and approvals were made with the strict understanding that these temporary structures and improvements were to be replaced at the earliest possible moment with similar buildings and facilities of a permanent nature and in permanent locations designated for the purpose in accordance with a preconceived general plan.

It has been urged upon concessionaires and superintendents that future work and improvements must be based upon some organized scheme of development in order to avoid the many mistakes which it was the misfortune of the service to inherit at the time of its formal creation by Congress.

During the year nine national parks and one national monument were visited for purposes of personal study, general advice and direction to superintendents and concessionaires, and in some cases the solution of specific problems requiring an immediate decision.

One trip of inspection was made for the purpose of obtaining first-hand information regarding a proposed national park in the redwood forests of northern California; and in addition to these visits the National Parks Conference, held in Denver, Colo., in November, 1919, was attended. Two papers were prepared for this conference, one on the desirability of a standard sign for all national parks, and another a general résumé

of the important points in the control and administration of the national parks from a landscape standpoint. An outline report was also submitted detailing a system of insignia to be worn on the uniforms of the members of the various branches of the administrative and protective divisions of the service.

Following these visits detailed reports of existing conditions and suggestions for the correction of undesirable conditions were submitted to you for your guidance and as a source of general instruction to the superintendents and custodians in charge.

The reservations visited during the year will be taken up in another part of this report and a synopsis given of the requirements, improvements, and accomplishments.

In spite of the unfortunate position the National Park Service was placed in as a result of working with a war-time appropriation during peace times, and accommodating itself quickly and systematically to the unusual demands made upon it, not as much actual work was accomplished by the service along lines of landscape improvement or control as had been hoped for, but the major portion of the improvements in the national parks have been the result of the efforts of the concessionaires.

However, the improvements which have been made directly in connection with the work of the service have been made, when possible, with a definite end in view through the development of a general plan of improvement.

SPECIAL WORK OF RANGERS.

One instance of special study by a ranger in one of the national parks has come to my attention and is of such a gratifying and commendable nature I believe it is worthy of special mention.

During the winter this ranger took a course in tree surgery—the study and care of the diseased and mutilated parts of growing trees. When the summer season opened and he was transferred to a checking station he occupied his spare time experimenting with the wounds in trees in the immediate vicinity of his station, and the results obtained were of the highest character and would compare favorably with similar work of professionals.

Special work of this kind among the members of the ranger forces helps wonderfully to strengthen the organization of the whole National Park Service organization, and every opportunity should be given these men for more extensive study and practical application.

Other lines of special work which suggest themselves at this time are taxidermy, forestry, surveying, and drafting. All of these are in use every day in our national parks, and would often save the superintendents considerable time and money during the year for small services of this kind, besides giving the individual a pleasant diversion from his regular duties.

SUBMISSION OF PLANS BY PUBLIC OPERATORS.

The winter and spring months were unusually active among the various public operators in preparing plans for expansion during the next season.

Numerous plans were submitted for approval, ranging from small service buildings to extensive additions to hotels and camps. Generally the plans submitted were carefully drawn and considerable thought and study had been given to details and arrangement, but in a few instances hastily drawn plans, more the nature of diagrams, lacking details and important information for a clear interpretation of the builder's intentions, were presented and returned for more specific information.

The rejection of these plans was done reluctantly in all cases, as the limited time within which it was necessary to begin work in order to be ready for the opening of the summer season was appreciated. However, it was necessary to take this step, as it was quite impossible to visualize in an intelligent manner the finished structure from the drawings submitted.

Drawings of proposed work are the only concrete method of conveying one man's ideas to another, and unless these drawings are carefully made and sufficient attention given to the details there is a wide field for a difference of opinion in their interpretation.

STANDARD PARK SIGNS.

The necessity and desirability for a standard type of sign for the national parks was discussed at the Denver conference, at which time instructions were issued to proceed with an investigation of the subject to the end that a standard type of sign be selected and adopted.

The result of this investigation was the adoption of a metallic sign with white field and green letters of such sizes and proportions that it would be easily and quickly read and be indestructible. It is further suggested that all signs be mounted on posts in preference to growing trees.

TEMPORARY BUILDINGS.

There is a strong desire on the part of the concessionaires to erect temporary buildings. Hiding behind the curtain of experiment, these buildings which, if not controlled, assume the nature of shacks, representing a small investment and as long as they answer the purpose, it is next to impossible to remove them without causing dissatisfaction and feeling against the service.

There is too strong a desire to clear the investment in the operating period of one season.

To obviate this condition, I would suggest the use of tents until the success or the failure of the enterprise is assured, then the erection or not, as the case may be, of a building of a type of architecture and appointments consistent with the undertaking.

BUILDING MATERIAL MARKET AND CONTRACT WORK.

The present condition of the building-material market seems to indicate that future building by the park service involving small sums can be less expensively undertaken if accomplished by Government labor than if let out by contract. With prices constantly

fluctuating, the contractor is bound to bid high in order to protect himself, while after material is purchased, the Government labor schedule remaining stationary, the margin of profit which the contractor allows as a protection is eliminated, and it is possible to erect many of the small structures which are necessary.

INDUSTRIAL GROUPS FOR PARKS.

Superintendents who have not already allotted certain space within their parks for this purpose should make such arrangements at an early date and plan to work toward a definite arrangement of buildings. This group would include such structures as are necessary for the proper and efficient administration of the park.

A complete administrative group would include buildings of the following nature: Stables, wagon and equipment sheds, garage and machine shop, blacksmith shop, electrical shop, paint shop, plumbing shop, carpenter shop, and warehouses. When a permanent camp is maintained at headquarters for housing and feeding laborers employed on park work, these buildings could be incorporated in the scheme also.

Lack of some such organized group of buildings results in loss of time and energy in administration, and the use of scattered buildings has no status in the efficient operation of any activity.

Some parks are more fortunate than others in having buildings already built which can be converted for such use; others have, through the pressure of necessity, gradually developed or have under development a group of service buildings; while several are working under the disadvantage of scattered buildings, inadequate in size and poorly located.

Many old buildings which have long since served the purpose for which they were originally constructed and intended should be condemned and removed. The removal of these buildings should be undertaken with a certain degree of care, for they contain a certain amount of lumber which is suitable for framing and other rough work when used in the construction of other buildings.

The building-material market, cost of hauling freight from railroad terminals, labor, and other factors entering into construction work which have increased in price by leaps and bounds during the past few years make the use of salvaged material from old buildings quite necessary if we are to keep within the limit of cost which has been set by Congress.

COMMERCIAL EXPLOITATION OF NATIONAL PARKS.

The past year has witnessed some of the most dangerous and selfish campaigns toward the acquisition of park lands and waters by private interests for purely commercial purposes that have ever been developed during their status as national parks, and the closing weeks of the last session of Congress revealed a new danger to the integrity of these national playgrounds by the passage of the Federal power bill, which would place them in a position and give them a status, the results of which in future years would seriously interfere with their administration, control, and function as national playgrounds, game preserves, and reservations of unusual scenic grandeur and landscape beauty.

The danger of removing the control and administration of the national parks from Congress and placing it within the powers of a commission whose sole duties are the promotion and development of water resources and irrigation is an extremely serious, dangerous, and shortsighted move on the part of those persons who are behind this legislation.

Although this is not the first time in the history of the national parks that their beautiful valleys, lakes, streams, and scenic areas have been in danger of commercial exploitation, the movement has come at this time with a new vigor and determination to transgress upon these areas and develop them selfishly and for the benefit of a comparatively small number of citizens within the immediate vicinity of the project, compared with the thousands and thousands of citizens for whom, and who, through their representatives, have set these areas aside and preserved them forever as national playgrounds for themselves, their children, and their children's children.

Two of our national parks, Yosemite and Glacier, have already suffered from such commercial exploitation, and it is these projects which have stimulated the movement to enter other national parks and develop their resources in a similar manner.

We are all familiar with the Hetch Hetchy controversy and its final outcome, whereby the city of San Francisco obtained the beautiful Hetch Hetchy Valley and is now constructing a 300-foot dam to confine the waters of the Tuolumne River for use in the homes of San Francisco and the development of power for sale through the San Joaquin Valley.

In Glacier National Park the Swift Current and Two Medicine projects are similar developments which will cause the destruction and loss of natural scenery which had been included within the boundaries of the park because it was considered of sufficient beauty and interest to be preserved as types.

Yellowstone, ever since it was set aside by Congress as a national park, has been jealously guarded against the intrusion of private interests for purely commercial purposes other than those necessary for the care and comfort of the tourists visiting the park to enjoy its geologic phenomena and diversified landscapes, but now it is being attacked from all sides; and unless this dangerous movement is defeated and crushed for all time Yellowstone will suffer the loss of areas of unusual scientific interest besides causing the destruction of thousands of acres of most charming and interesting landscape, together with the loss of an equal area of woodland and forest which, aside from its own individual interest and landscape value, are the habitats of many species of wild game.

Only by the preservation of such areas will game continue to increase in numbers sufficient to preserve it from total extinction, as was the situation when the few remaining survivors of the original herds were gradually driven to the frontier and finally found refuge within the boundaries of Yellowstone National Park.

Like the wolf clothed in the sheepskin, these projects may appear harmless to the casual observer; and persons unfamiliar with the details are led on by personal appeals and inducements, such as irrigation and greater water supply, but behind it all will be

found the real motive—power to be sold at a comfortable profit. The promoters of these projects realize that if located on Government property they have eliminated the necessity of purchasing private land, the cost of which would greatly increase the initial investment.

These promoters are willing to sacrifice their own heritage, that of their children, and that of their neighbors' children, for the purpose of adding to their own prosperity and comfort at the expense of that of others who have equal rights and interests to be considered.

Continued efforts should be made to defeat these selfish movements, and public sentiment and patriotism should be aroused throughout the country in an endeavor to place the national parks and monuments within a legislative barricade which can not be broken down.

The solid stand which the honorable Secretary of the Interior, John Barton Payne, has taken toward the defeat of these projects is indeed comforting, and it is fortunate that the national parks have a guardian who thoroughly appreciates their value, function, and the necessity for protecting them from selfish pecuniary interests. But one man can not fight many, and it is the patriotic duty of every American citizen to lend a hand in this important matter and help preserve and protect his own and his neighbors' interests against these inroads.

Broad-minded and patriotic citizens realize fully the necessity for the prosperity of the country, the advantages of developing its resources, but they should not allow these projects to disfigure the natural museums, historic, geologic, and scenic areas which have been created and set aside for the advancement of learning, the broadening of public education, the promotion of public health, and the preservation of wild life, all of which are a part of the broad educational campaign which is being developed in their behalf through the development and preservation of the national parks and monuments.

The progress which has been made in the establishment of the national-parks system and the purpose for which they have been established have aroused the interest of foreign countries throughout the world as valuable in a general national uplift and as inducements toward the development of a higher standard of patriotism and broader education.

AEROPLANES IN NATIONAL PARKS.

The aeroplane is rapidly coming to the front as a method of transportation to and from the national parks, and within a few years its official recognition as a safe and necessary method of transportation will be established, and the necessary provisions for its accommodation must be made.

By some the success of the aeroplane as a means of transportation is looked upon skeptically, as was the automobile during the period of its perfection as a passenger-carrying vehicle, and it is doubted if air transportation will ever replace the automobile as the automobile has replaced the horsedrawn vehicle; still it will figure very prominently in the transportation of passengers and freight.

The past year has witnessed several successful flights into Yosemite Valley, making it necessary to provide a temporary field for landing and taking off.

For purposes of general information, Superintendent Lewis has made it a point to obtain from these aviators such information as he could regarding the safety of aeroplane travel in the mountainous regions, and all agree that passenger-carrying planes for use in the mountains should not be considered safe unless equipped with twin motors, and that traffic to and from national parks should not be encouraged until planes have been so equipped and have been developed to a more definite degree of mechanical perfection.

Like the automobile in the early stages of its development, the aeroplane has made wonderful strides in mechanical development and perfection, but it is still far from a finished product, and a great deal remains to be learned regarding its equipment and operation under different atmospheric conditions. Therefore it seems that although the admission of aeroplanes to national parks should not be discouraged, still the park service should remain in a passive attitude until such time as it has been able to gather all available data, learn as much as possible from the experience of others, and then slowly develop at its expense landing fields the condition of which it is willing to assume the responsibility for in case of an accident.

Wind currents are the most important study in locating a field for aeroplane work, and as these constantly change, it requires an area at least one-half mile square for successful operation.

Portable markers must be maintained, which are shifted according to the direction of the wind, and the surface of the field should be as nearly level or smooth as it is possible to create and maintain such an earth surface. Slight humps and hollows often cause serious accidents in landing and taking off, and these should be carefully smoothed out.

The design and the location of the hangars should be carefully studied in order that they shall not be too conspicuous and will fit in agreeably with the local conditions. Such structures will be necessary and must be provided for, as they will provide a service as necessary in the successful operation of the aeroplane as the garage is in the successful operation of the automobile.

Some parks have areas which can be readily adapted to this purpose, but in others some serious thought and study will be necessary in order to work this problem out in the most satisfactory manner and in creating such large open areas make them appear as natural as possible.

If possible, the rigid straight lines of a square should be avoided and the outline made to resemble as closely as possible a natural contour. Where it will be necessary to develop such fields in thickly wooded parks this will require careful study, but the ultimate idea should be to create what will appear to be a natural meadow.

The topography of some parks will make it necessary to create these fields within very restricted areas, as is the case in Yosemite Valley, and under these conditions it will be necessary to limit landing and taking off to one direction only and at certain hours, according to the wind.

MUIR WOODS NATIONAL MONUMENT.

Muir Woods was the only national monument visited during the year, but frequent trips were made to this interesting reservation in connection with business trips to San Francisco.

The boundaries of the Steep Ravine area, which Hon. William Kent proposes to present to the Government as an addition to the Muir Woods reservation, were followed out on the ground during one of these visits, and an excellent opportunity was thus presented for obtaining a very comprehensive idea of the varied and interesting landscape features which enter into the composition of this interesting area.

The bare, brown, rolling hills, intercepted by steep ravines clothed with a dense growth of oak, redwood, and madronia, through which trails have been made for the use of the thousands of week-end hikers and campers from the cities and towns around San Francisco Bay, are particularly interesting from a landscape viewpoint, and, as one follows these trails winding in and out through the ravines and over the hills he becomes thrilled with the broad views and vistas reaching to the bay, with the city in the background on one side and the Pacific Ocean on the other.

It is indeed unfortunate that national monuments as popular as Muir Woods are, and so easily accessible, can not be more intensively developed and a few of the more essential necessities which are necessary to properly develop and protect such a reservation be installed.

A design was made for a small dwelling and office for the use of the custodian, but on account of the excessive cost of the materials it was necessary to postpone its construction until some future date.

ROCKY MOUNTAIN NATIONAL PARK.

A brief visit to Rocky Mountain National Park during the summer months, when all activities were working under the pressure of heavy summer travel, afforded an opportunity to study conditions at a time when the greatest needs were made most evident.

It is regretted that it was not possible to devote more time to the many interesting problems which need special study, but fortunately some of the more important ones were investigated and commented on in my special report.

The administrative headquarters of this park, being situated under conditions so totally different from those of any other national park, make the administrative problems of unusual interest, and plans relating thereto should be developed accordingly. These embrace the housing of employees and the location and housing of the equipment necessary in construction work and other questions of this nature which are so closely related.

The site in the village of Estes Park which has been offered as an administrative site for the buildings of the park service was inspected and tentative sketches have been made. These, however, are subject to further study and consideration.

The plans and the location of the rustic gateway to be constructed on land donated for the purpose at the park boundary on the Fall River Road were approved, as were plans for other gateways to be erected when funds permit.

An inspection of the completed portion of the Fall River Road on the east side of the range was made on horseback and continued over the surveyed line to the head of construction on the west side at that time at a point not far from Milner Pass.

The completion of this road, aside from adding a much-needed and valuable connection between the east and west sides of the range, will open up to the tourist a country abounding in grandeur, distant views, interesting vistas, wild gardens of many-colored flowers, mountains rich in color, and a forest growth equally as interesting.

Unfortunately a large portion of the land within the park is under private control, and this condition makes the control of landscape interest and features a problem of some seriousness.

It is hoped that cooperation in the commercial development of these private lands can be brought about in such a manner that landscape interest will not suffer unduly.

During the winter various plans of concessionaires for new buildings were inspected and passed upon.

GENERAL GRANT NATIONAL PARK.

Improvements and developments in General Grant National Park, although not extensive, have been such as to have made a material change in the appearance of the area in the vicinity of the meadow and the small village.

The buildings of the permanent camp which are considered temporary pending the development of plans for the construction of a new and more modern establishment were renovated and covered with bark, thus making them more attractive than the former green-painted boards and battens.

The completion of the new administration building on the site which was selected a year ago has framed one corner of the village group and given the park service a substantial and adequate building for its administrative work.

A change has been made in the alignment of the park road just within the entrance which is an improvement in both line and grade over the old road.

Throughout the park directions were given for general improvements which, although of a minor nature, will have a material effect upon the general appearance.

SEQUOIA NATIONAL PARK.

Sequoia National Park is rapidly pushing to the front in popularity, and its enlargement forming the Roosevelt National Park and the construction of new roads up the canyon of the Middle Fork will push it to the front as one of the most popular of our national reservations.

With this increase in popularity and travel additional and more adequate housing accommodations must follow. The present hotel and camp are inadequate, poorly located, and unattractive, and preliminary study in this direction has convinced me that a site in the vicinity of Moro Rock or Log Meadow would be more attractive.

The camping situation in The Giant Forest has developed to a point where it is becoming rather a problem to preserve the natural conditions and at the same time provide adequate accommodations.

The natural tendency for people to congregate has resulted in taxing the area in the vicinity of the village to its utmost capacity, and has also resulted in a gradual destruction of the undergrowth, leaving the ground bare and dusty.

Expansion of the camps is necessary and should be provided for by an extension along the Wolverton Road and toward the vicinity of the Sherman Tree. This, of course,

means an extension of the water supply and when installed a rather extensive sewage disposal system.

The semipermanent camps or those camps occupied during the entire season by residents of the valley towns also require regulation and renovation. I have referred to this situation in former letters and reports.

A general survey of the conditions in The Giant Forest discloses many small problems and improvements which should be made to bring the standard of perfection and appearance up to the level which the service is endeavoring to establish and maintain, and it is hoped funds can be spared in the future to work out some of these problems.

Following the suggestions in my special report the old post-office building has been covered with bark and painted and now harmonizes with the general situation.

I regret that at the time of my visit the trip from Hume into the Kings River Canyon could not have been extended to include a trip across the mountains and back to The Giant Forest, for this country, which is within the proposed boundaries of the Roosevelt National Park, is one of unparalleled beauty and grandeur.

CRATER LAKE NATIONAL PARK.

Entering Crater Lake National Park by the west entrance and leaving by the south entrance, together with a trip around the rim road, completed a tour of the roads within the park.

This trip made during the summer months made the visit interesting and profitable, as all activities were working under the strain of tremendous summer travel.

The operations of the hotel company at the rim were carefully investigated and some suggestions for improvements were made on the ground. The camp situation at Anna Springs was also investigated.

An inspection of the Government buildings at Anna Spring, the administrative headquarters of the park, was also made and an area selected suitable for the development of an industrial group. Later a plan was prepared as a guide in laying out this group, and working drawings were made for a storehouse which will probably be the first building to be constructed.

Each entrance was also studied with the idea of designing a suitable entrance at some future time.

The addition of the Diamond Lake country to the north will add materially to the scenic attractions of Crater Lake National Park, and the construction of the proposed auto road across the Pumice Desert to the Diamond Lake country will provide a valuable and much to be desired entrance from this quarter. Some suggestions regarding the location of this road are embodied in my special report.

During the winter various plans of the hotel company were submitted and passed upon, together with plans for a small studio building to be erected at the lake by the photographer having this concession.

In the location and construction of buildings at the lake consideration was given to their proximity to the rim of the crater and also to the materials to be used. The volcanic rock which is found close at hand offers unlimited possibilities when used alone or in combination with logs in the design of simple attractive buildings, and its use is therefore advocated and desired.

The completion of the State highway from Medford, Oreg., will bring to Crater Lake a travel and popularity which it has never before enjoyed.

MOUNT RAINIER NATIONAL PARK.

Eternally snow-capped and rising majestically above the surrounding peaks, its slopes clothed with forests of trees of no small dimensions, its higher slopes with a carpet of wild flowers extending from the more temperate climes to the very edge of the retreating snows melting under the summer sun, its glaciers constantly pushing downward and from whose snouts rush streams of milky white, ice-cold water, in Mount Rainier nature has given us another remarkable example of her resourcefulness in mountain sculpture and decoration.

Developments at Mount Rainier have progressed in a very satisfactory manner. Plans for future buildings to be constructed at Paradise Valley for the accommodation and entertainment of the rapidly increasing tourist travel have been made, approved, locations selected, and construction started.

The coming year should see the new power plant of the company in operation, plans for which were passed upon during the spring months.

One of the most satisfactory developments is the acquisition of the Longmire Springs property by the Rainier National Park Co. Now, this property is in the hands of people vitally interested in the successful development of the park, and further concern as to the future of this meadow is removed.

The gradual accumulation of equipment and tools necessary for the maintenance of roads and other administrative work has made it necessary to formulate a definite scheme for housing this material. Accordingly, a plan has been prepared for the development of an industrial group at Longmire Springs.

Sketches were prepared for a short span bridge which will be used as older structures are replaced. The design is simple and local materials have been used in the construction.

The new location for the Paradise Valley checking station which was selected will be an improvement over the old one both in location and ease in checking.

YOSEMITE NATIONAL PARK.

The reorganization of the Yosemite National Park Co. during the winter and the preparation of a comprehensive building program to be executed in the spring, required frequent consultations with the officials of the company, and in the spring when construction began the work was pushed in order to be ready for the opening of the summer season.

One of the most important and necessary structures erected was a garage and repair shop to care for the summer-tourist trade and to be used during the winter for the repair and housing of the company's motor equipment.

This building, complete in itself, of frame construction, in which logs and shakes have been used to good advantage, is centrally located, well hidden, and of a type of archi-

texture in keeping with the other buildings of the company and still a type which is harmonious with the surroundings.

At Yosemite Lodge 65 new cabins were erected for the accommodation of tourists. These cabins, totaling 100 rooms and fitted with every modern convenience, were constructed from approved plans and in accordance with a general plan for the rearrangement of this camp which has been under consideration for some time. Following seasons will witness further developments along this plan, and the ultimate completion will result in an institution which will be unique and of the highest character.

The village scheme, which for many years has been the subject of much discussion, was restudied during the winter, and, it is believed, a well-organized plan for the development of this area has been now developed.

The area was first divided into zones—commercial, industrial, and residential—giving each the areas best suited to them for their particular use and later working out the details necessary to each.

Apart from, but convenient to, the village areas were reserved for a hotel and an administration building for the National Park Service.

Under the direction of Mr. Charles K. Sumner, architect, of San Francisco, Calif., plans for the rangers' clubhouse were completed, the contract let, and work started in the spring.

Planned around three sides of a rectangle, of frame construction, two stories in height, and containing living and sleeping accommodations for 30 men, besides every modern convenience, even to electrical heating and cooking equipment, this building will be one of the attractions of the valley and afford the unmarried employees a home with every comfort and convenience.

A great deal of care was given to the preparation of the plans of this building in order to provide for all the requirements, design a building harmonious in its setting, attractive in exterior appearance, and comfortable within. The architecture is original, free, and by the use of logs, stone, and shakes an attractive structure has developed.

It is situated on the south side of the valley overlooking the meadow, with broad, extensive vistas, both up and down the valley.

Work was continued about the homes of the employees, and the lawns and flower beds were further cultivated and improved.

With funds donated through the generosity of Mr. M. Hall McAllister, of San Francisco, and the Sierra Club, a small outdoor auditorium, seating about 250 people, was constructed in a natural amphitheater to the east of the Sierra Club Lodge.

The seats consist of three rows of 12-foot pine logs about 18 inches in diameter, with the bark left on. These were arranged on a slope facing a speaker's stand. The logs were further provided with backs by placing in holes bored in the logs, 6 inches from each end and 19 inches apart along the log, and 6 inches to 8 inches back from the center of the log, 2-foot lengths of 1-inch condemned water pipe. Between these pipe supports a brown canvas back was slipped over the tops and held in place by means of pockets which had been sewed on at 19-inch intervals.

An attractive, unique, and comfortable outdoor auditorium was thus constructed at small expense and worthy of adoption by other parks where the need for such a structure would be appreciated.

In my special report written in 1919 on the forestry conditions on the floor of the valley, I mentioned particularly the necessity of removing certain trees which were rapidly growing into the vista of the valley and cutting off Half Dome and Clouds Rest as viewed from the point on the Black Spring Road, locally known as "The Gates of the Valley" or "Bridal Veil Vista."

Fortunately, through the generosity of the management of the Curry Camping Co., the labor necessary to remove these trees was provided, and the result was highly satisfactory, for it opened once more a vista and background which was rapidly becoming hidden and lost.

The construction of the garage at Camp Curry from plans which were passed upon during the winter was started in the spring and continued into the summer. Plans were also approved for a new post-office building at Camp Curry. Both of these buildings are of logs and shakes and of a type of architecture in keeping with the buildings which this company has formerly erected.

MESA VERDE NATIONAL PARK.

This interesting national park was visited following the Denver conference; and, although cold, disagreeable weather conditions were encountered in Denver, and part of the journey to the park was made in a blinding snowstorm, our arrival at Spruce Tree House Camp was made under the most ideal weather conditions, and the three days spent there were perfect—balmy, and as warm and comfortable as could be desired.

A careful study was made of the area immediately surrounding Spruce Tree House, the center of intensive development; the entrance and new road from Mancos were also inspected.

A few of the more important ruins, including Balcony House, Sun Temple, Cliff Palace, Spruce Tree House, Square Tower House, and some of the newer excavations were visited and conditions noted.

The peculiar topographic conditions, with wide, long mesas, covered with a dense growth of pinion and cedar, separated by wide, deep canyons, in which are located the ruins, make this park of unusual interest from a landscape standpoint, but its popularity and future are dependent entirely upon the perfection of railroad transportation in that section of the country. This is an unfortunate condition, for its educational value to the people of this country, as well as the whole world, is extremely important, and it should enjoy a popularity equal to some of the other parks.

Some preliminary thought was given to the construction of a suitable gateway at the entrance of the park, and in this connection it was thought that the ruins offer many suggestions for an interesting structure, also that this gateway might be constructed of sandstone blocks from the ruins which have not been used in the restorations.

Plans for the enlargement and improvement of the permanent camp at Spruce Tree House were made and directions given for immediate constructions to care for the coming season's business. Other minor problems were investigated and suggestions made, the details of which are contained in my special report.

GRAND CANYON NATIONAL PARK.

It is doubtful if our national parks receive from the public the consideration they should as winter playgrounds, or if the public seriously thinks of the landscape possibilities in the parks under winter conditions.

A blanket of soft new snow seems to intensify the colors in the canyon, seems to increase the distances and make this wonderful work of nature more wonderful and grand than under normal or summer conditions. It was my good fortune to visit the canyon after a snowfall, and the impressions I got at that time, with the trees heavily laden with snow, contrasted with the vivid coloring of the rocks, will long remain a pleasant memory.

The recent addition of the Grand Canyon to the national park system has added an area which, fortunately though developed originally by private capital, has been developed with a certain degree of refinement and success. Perhaps had the National Park Service controlled the original development, it might have located certain buildings on different sites and avoided some of the unpleasant conditions which exist, but in general the character of the building which has been done under the direction of the railroad company is commendable.

As certain buildings for immediate occupancy and use were necessary when the National Park Service entered upon the work of administering this park, it was found necessary to construct a new warehouse, an office building, and a stable. Each of these buildings is of frame construction, simple in design, and capable of expansion. The office building was erected on a site which will later be developed as a colony for the homes of the employees of the service, and this building was planned with the idea of so converting it at some future time.

Consideration was given to the selection of a future site for an administration building which will be in a location more readily accessible to the tourist and at the same time central and strategic from an administrative standpoint.

A general plan was worked out for the development of an industrial group on an area sufficiently far removed from the other activities to be inoffensive to them and at the same time within easy communication distance of the administrative center. The stable formed the first building of this group.

The course of the proposed cableway across the canyon was carefully considered from a landscape standpoint and a special report submitted to you in regard to it, which went into some detail as to the merits and demerits of such a structure.

A general survey such as was possible under the weather conditions was made from El Tovar to Hermit's Rest, and a location for a seat to be built on a hill commanding a broad view to the south was selected and suggestions made as to its construction.

The automobile camp grounds were inspected, and suggestions regarding this area were submitted to you in my special report, as were conditions regarding the pictograph rock.

During the winter numerous plans of the company for new buildings and the alteration and enlargement of others were submitted and passed upon.

YELLOWSTONE NATIONAL PARK.

The unusual increase in travel to Yellowstone taxed its tourist accommodations to a point where it was necessary to provide temporary housing accommodations at short notice, and although plans for the rearrangement of the camps had been under consideration for some time, the change of management of the permanent camp properties brought with it a change of policy and new ideas in regard to handling the increase in travel.

Accordingly it was deemed best to postpone any radical changes in camp plans until it could be ascertained with some degree of certainty the extent to which this increase would develop.

With the close of the summer season preparations were made for the completion of the camp at the lake, which had been closed for one or two seasons, also a new central Building at Roosevelt Camp, near Tower Falls, was planned and work continued during the winter months.

The opening of these two camps will greatly relieve the burden on the others in this chain and also add to the camp properties two well-constructed, attractive buildings.

Roosevelt Camp is particularly attractively situated and should develop into one of the popular camps where rest and quiet are desired by those who do not care for the livelier camp life.

Mammoth Camp also underwent a change and rearrangement in its housing scheme, and a better and more permanent system of cabins was the result.

At the canyon a new store building of log construction has replaced the old building which has served this purpose for some time and which was an eyesore and disgrace. The present building is a great improvement over the former and a valuable addition to the buildings in this section of the park.

The store at the lake, which for many years has occupied an old building, will soon be moved to a new and modern structure of rustic design and in a more attractive location than that occupied by the present store.

At the important centers in the park attractive filling stations have been designed and erected which are unique in this field of automobile service. Constructed of logs and stone and located with some thought as to their relation to the surroundings, they have been the subject of much favorable comment from the visitors to the park.

The new studio building erected by Mr. Jack Haynes from plans approved of by the service has added an attractive studio to the group of buildings in Mammoth village.

During the winter months various plans from the concessionaires were passed upon for additions and extensions to their accommodations. Sketches were also prepared for new ranger stations to replace those at the important centers in the park, and which are in a dilapidated and unsanitary condition. Sketches for other small service buildings were also prepared, one of which was a fire lookout to be erected on top of Mount Washburn.

It was gratifying to note the improvements which had been made within the park during the period of one year, and although some of them were of a minor nature, still they all had a direct bearing on each other and the whole. The continuance of these small improvements from time to time will eventually knit into a harmonious whole, and we will have eliminated many of the unpleasant conditions which we inherited.

The work which has been so successfully done in developing the automobile camps should be carried on diligently, for the automobile is daily becoming one of the modern

vehicles which brings the greatest number of visitors to the national parks, and it is the people who so visit the parks who get the most out of what they have to offer.

I can see these camps developed to a point where they will be grouped around a community building in which the campers will congregate for lectures, rest, and evening recreation and many other services which conditions and time will suggest.

RECOMMENDATIONS.

Much has already been written, talked of, and some efforts have been made to acquire private lands within the national parks. The desirability of the control of these lands, or a part of them, by the park service is of the utmost importance, and the interest which has already been aroused should not be allowed to die out, for their control will be of vital concern to future generations.

Where reclamation projects have been established on lands within national parks, and the water levels of lakes and streams so raised that woodlands have been flooded, cooperation between the park service and the Reclamation Service toward the removal of timber within the flooded areas will greatly improve the appearance of these bodies of water and the shore lines, whether at flood water or low water.

There is nothing more desolate in appearance than trees and underbrush, brown and dead, standing in a body of water; and when the water is withdrawn and they stand on the muddy, barren lake bottom and higher shore lines, this appearance of desolation is augmented to the highest degree.

The national monuments, which enjoy a popularity equal to that of some of the smaller national parks, would be greatly improved if more funds for the installation of some of the most important necessities could be provided. These would include sanitary provisions, water supply, accommodations for picnic and camping parties, and the improvement of trails and roads. It is hoped that the future will see some of these more popular reservations developed to the extent where they will offer these accommodations.

The study of and the concentration of efforts toward the higher development of the automobile camp should go on with renewed vigor. This form of visiting and enjoying the national parks has increased so rapidly within the past year it is safe to believe that it has by no means reached the peak of its popularity.

The development of these camps means more than the provision of space for this form of outdoor life, but also means the installation of various accommodations.

The construction of community buildings in the larger camps which would contain bathing facilities for both men and women, laundry tubs, branch stores which would carry such staples as campers would need, and perhaps a branch post office are requirements which should receive consideration. A large room with tables and chairs and fireplaces would also be appreciated in the evenings and during inclement weather. Lectures in the evening could be held in these large rooms on the history, flora, fauna, and geologic interests of the park and would be enjoyed and appreciated by the campers.

The establishment of museums and the collection of specimens for exhibition should be further encouraged and a small portion of the funds devoted to this work each year. If this work is concentrated upon, the collections grow rapidly and duplicate specimens can be exchanged with other parks, thus adding to the collection both in interest and numbers.

My previous statements in regard to the making of borrow pits along the park roads should be constantly kept in mind by the superintendents. Old pits should be closed and new ones made at points which are screened from the park roads.

The study of the aeroplane as a method of transportation to and from the parks should be diligently followed and all possible data collected for future use and reference.

HAWAII NATIONAL PARK.

HORACE M. ALBRIGHT, field assistant to the director.

GENERAL STATEMENT.

Hawaii National Park was established by act of Congress approved August 1, 1916 (39 Stat., 432). The park at the present time is composed of three noncontiguous areas, two on the island of Hawaii, the largest island of the group composing the Territory of Hawaii, and one on the island of Maui. Besides these areas, the organic act authorizes the inclusion in the park of a fourth tract of land, to be later selected, this tract to connect the two areas on the island of Hawaii. Briefly, the park lands may be described as follows:

1. The Kilauea section, which embraces the crater of Kilauea and much of the surrounding region. Its area is 35,865 acres, four-ninths of which, when the park was created, was public lands.

2. The Mauna Loa section, which includes the crater of Mokuaweoweo, the summit crater of the great mountain Mauna Loa, with some adjacent lands. The total area is 17,020 acres, of which half was public land when the park was established.

3. The Haleakala section, which is on the island of Maui, and includes the crater of the extinct volcano Haleakala. Its total area is 21,150 acres, about one-third of which was public lands in 1916.

4. This tract has not yet been selected, but when surveyed and made a part of the park it is expected that it will contain 360 acres, not more than half of which will be public lands. This tract will connect the Mauna Loa and Kilauea sections of the park.

When the park was created, therefore, only about four-ninths of the total area of 75,295 acres was public land. One of the provisions of the organic act inhibited the appropriation of public funds for the improvement and maintenance of the park until the United States should acquire, by proper conveyance, such perpetual easements and rights of way over private lands in the park as the Secretary of the Interior might find necessary to make the park "reasonably accessible in all its parts." Also, the organic act contained an inhibition that no more than \$10,000 should be appropriated annually for the maintenance, supervision, and improvement of the park unless an amount in excess of this sum should first be expressly authorized by law. On August 1, 1916, therefore, a park was established in the Territory of Hawaii with such restrictions placed upon the use of Federal funds in developing it as to make it almost impossible to immediately do anything with the park.

NEGOTIATIONS FOR THE ACQUISITION OF PRIVATE HOLDINGS.

During the first year after the establishment of the park the National Park Service devoted itself to the task of ascertaining the names of the owners of private lands within the park areas, the amount of land owned by each, and the character of the land making up these private holdings. In this work we were fortunate in securing the assistance of Mr. Lorrin A. Thurston, of Honolulu, who happened to be spending a considerable period of time on the Atlantic seaboard.

At the same time Mr. B. D. Bivenburgh, land commissioner of Hawaii, and Hon. C. J. McCarthy, treasurer of the Territory and now governor, acting on behalf of the National Park Service, conducted preliminary negotiations in the islands with owners of private lands looking toward their conveyance to the Territory or to the Federal Government. Hon. Lucius E. Pinkham, then governor of the Territory, also aided in this work.

The efforts put forth in Hawaii to clear up the private holdings in the park areas resulted in the acquisition, in the early part of 1918, of all of the private lands in the Mauna Loa section of the park. For a nominal sum these lands were conveyed to the Territory by the Parker estate and the Bishop estate. No other lands were acquired by donation, although assurances were received that the roadway strip to be selected for the purpose of connecting the Kilauea and Mauna Loa sections would be donated at such time as the National Park Service might make this selection and desire the incorporation of the lands in the park.

In June, 1918, the Secretary of the Interior visited the Hawaiian Islands and he conducted further negotiations with a view to securing private holdings in the Kilauea section of the park. In the course of these negotiations it developed that the only way in which the lands in this section could be acquired would be by purchase or by an exchange plan under which territorial lands would be traded for private holdings in the park area. Legislation giving the governor of the Territory authority to make exchanges of this character was introduced in Congress and passed the United States Senate on February 25, 1919, but was not considered by the House before the close of the session.

In April and May, 1919, Director Mather visited the Territory and conducted further negotiations looking toward the acquisition of private holdings under the proposed exchange law as soon as it should be enacted. When the Sixty-sixth Congress convened the exchange bill was reintroduced and it was finally enacted into law by the President's approval, on February 27, 1920, of the bill passed by both Houses. (Public No. 150, 66th Cong.)

TRIP TO HAWAII.

Upon the enactment of this law, and after my designation as field assistant to the director, orders were issued for me to proceed to Hawaii for the purpose of advancing the progress of the exchanges already tentatively framed, and to make a thorough inspection of the park with a view to suggesting necessary improvements that might be undertaken immediately upon the closing of the exchange transactions. I left San Francisco on the Matson Navigation Co.'s liner *Wilhelmina* on March 8, 1920, and arrived in Honolulu on the evening of March 18. I remained in the islands three weeks and returned to the mainland on the Matson Co.'s liner *Matsushima*, which left Honolulu on April 7 and arrived in San Francisco on April 18.

While in the islands I not only inspected the three park areas, but I also studied the tourist possibilities of all the islands. I made a trip to the island of Kauai and examined Waimea Canyon, one of the great natural features of the islands, a miniature of the Grand Canyon of the Colorado. It has often been suggested by prominent citizens of the islands that ultimately this canyon should be made a part of the Hawaii National Park.

THE KILAUEA SECTION.

After spending a few days in the city of Honolulu meeting citizens of the islands interested in the development of the park, representatives of the owners of private holdings in the park, and members of the tourist bureau and chamber of commerce, I proceeded to the island of Hawaii upon the steamer *Mauna Kea*, landing at the port of Hilo. From this point I went to the Kilauea section of the park, giving attention, however, while en route to the park to problems of road construction, forest conditions, and similar points of interest bearing on the operation and development of the park. With headquarters at the Volcano House, which is located on private lands in the park, I made trips in all directions through the park and into the interesting volcanic areas beyond. While I did not reach the summit of Mauna Loa, I visited Puu Ulaula, not far distant from the summit crater. At this point a splendid rest house has been erected through public subscriptions, principally by members of the Volcano Research Association and business men of Hilo.

WONDERS OF THE KILAUEA SECTION.

I was amazed by the wonders of this section of the park. My final conclusion, after seeing other sections, was that this area should be the first to receive the protection of the National Park Service, as well as the expenditure of Federal funds in development and improvement. Its central feature, of course, is the live pit of fire, Halemaumau, which, translated, means "house of everlasting fire." This pit is in the center of the main Kilauea crater, which is a great depression in a domed mountain, 4,000 feet high, lying adjacent to and so completely connected as to appear to be a part of the eastern slope of Mauna Loa. There is no necessity for describing this active "lake of fire," because this is a progress report, but I want to record my feeling that this is the most wonderful feature of the National Park Service, surpassing the geysers of the Yellowstone, the waterfalls of the Yosemite, and even the big trees of Sequoia Park. It is the most awe-inspiring thing that I have ever observed, and I have no hesitation in predicting that when once the people of the United States realize what a remarkable thing this volcano is it will become the objective of thousands of visitors.

But the volcano is only one of many sights of a wide district. There are many other steaming and dead craters; great forests of primeval tree ferns, many with fronds 30

feet in length, which arch overhead and make agreeable shade; forests of koa and ohia trees, valuable Hawaiian hardwoods; lava trees and tree molds, the latter being perfect casts of great trees which have been buried by lava torrents and burned away slowly, leaving impressions of their forms in the ground.

There is Bird Park, a beautiful natural park, or kipuka, as the Hawaiians call it, completely surrounded by ancient lava flows, and in which grow numerous species of native trees, many of them very large. Also in this area there are many nearly extinct and very beautiful native birds.

On the other side of the park is the Seven Craters area, which is traversed by the Cockett Trail. Several of these great craters are almost as remarkable as the active volcano itself.

ROADS AND TRAILS IN THE KILAUEA SECTION.

The road from Hilo to the Kilauea Park area is a very good highway, built by the people of the islands. Not a cent of Federal money has been expended on this road or on any other road on the islands of Hawaii. The distance from Hilo to the park is 30 miles. Much of the road work was done by prison labor, and it is, therefore, impossible to estimate its cost. Commencing 4 miles from Hilo, a concrete road has been built $3\frac{1}{2}$ miles in the direction of the park, at a cost of \$158,000. A contract has been let to construct a concrete road from Hilo to connect with the section already built. This road will be built by the county of Hawaii. The further sum of \$215,000 was appropriated by the Territorial Legislature to continue in the direction of the park the concrete highway from the piece already built. In view of the fact that this road is the main approach to the park, and in view of the further fact that Hawaii has not participated in any of the funds made available for road building in cooperation with the States of the Union, it seems to me that the Federal Government should aid in the completion of this concrete road to and through the park.

Within the park itself there are 16 miles of road. Much of this was built by prison labor. A road 7 miles long leads from the main approach highway near the park boundary to the floor of the big Kilauea Crater, and ends only a short distance from the active Crater Halemaumau. Much of the remaining road mileage is a part of the cross-park road leading through the district of Kau.

TRAILS IN THE PARK.

There are about 20 miles of trails in the park exclusive of the Mauna Loa Trail. The Cockett Trail I have already mentioned. It traverses the Seven Craters area, leaving the road leading to Halemaumau near the Crater Keanakakoi, and connecting numerous craters, including the Devils Throat, Puu Huluhulu, and the wonderful Makaopuhi Crater. It also makes accessible the lava trees and the very interesting primeval forest. The old Keauhou Road, which is not available for automobiles, may also be regarded as belonging to the trail system. It takes its course through much of the same area as is traversed by the Cockett Trail.

PATENTED HOLDINGS IN THE KILAUEA SECTION.

As it was evident that the Kilauea section is the most important part of the park, I devoted most of the time I had to give to the private-land question—to the private holdings in this area.

The most important of these holdings, so far as the administration of the park is concerned, belonged to the Bishop estate, and included not only the hotel sites and the windward side of the crater and the best forests of the park, but also most of the crater itself, and even part of the active pit of fire, Halemaumau. These holdings total approximately 12,500 acres. In 1916 these lands were valued at \$125,570. All but 650 acres were offered to the Territory in 1916 for \$52,820. To be more exact, the Bishop estate was willing to dispose of 11,837 acres for \$52,820. The 650 acres embraced the Volcano House property and house lots along the main approach road, which the estate desired to sell under a development plan of its own. While I was in Hawaii the Bishop estate and Territorial officials came to an agreement whereby this tract of 11,837 acres was to be conveyed to the Territory in exchange for about 900 acres of land at Mokakea, on the island of Hawaii. This exchange was developed under the act of Congress already mentioned, the lands being considered of approximately equal value, because for several years they have produced approximately the same revenues. The Mokakea lands were highly developed sugar lands, whereas most of the park lands in private ownership were grazing lands.

EXCHANGE INVOLVING THE VOLCANO HOUSE.

I proposed another exchange involving part of the 650-acre tract upon which the Volcano House is located, with the idea of getting control of this advantageous hotel site, and also for the purpose of acquiring the land along the main approach road, in order that the forest growth might be protected. It seemed to me that should this land be sold for summer homes there would be danger of the highway losing much of its sylvan beauty. This exchange proposal is now under consideration. The Bishop estate land is being appraised and the Territory is making an effort to find Government lands of approximately equal value that it can convey to the estate under the exchange law.

The consummation of the larger exchange will give the National Park Service sufficient control of the Kilauea section to justify our requesting the appropriation of funds for the protection and maintenance of the park, and upon the conclusion of the exchange now pending the private-land problem, so far as this section of the park is concerned, will never be a troublesome factor. We will be free to proceed with the construction and maintenance of roads and trails, and we will have the opportunity to develop hotel and camp facilities in accordance with the policies of the service. We will also be able to exclude cattle and pigs, which in the past have so greatly injured the forest and other vegetable growth in the park, and to take any other steps necessary to improve this great national resort area which, I must repeat, contains wonders not equaled in any other park, and therefore having no peers in the world.

HOTEL ACCOMMODATIONS.

There are now two hotels in or near the park. One, the Volcano House, situated on the rim of the Kilauea Crater, is on private holdings now and involved in an exchange proposition.

The other, the Crater House, a smaller establishment, is located near the park line on the main road from Hilo, and almost at the point where the side road to Halemaumau leaves the main highway.

Neither of these hotels is sufficient to accommodate the people who now visit the volcano. One or both of them should be greatly enlarged, and it is most desirable that a modern hotel, with first-class accommodations, be erected. This should be built on the site of the present Volcano House or another site overlooking the rim not far distant.

I regret to record the death, in Athens, of Mr. Demosthenes Lycurgus, owner of the Volcano House, a man who took unusual interest in the park and who had planned to make very extensive improvements provided he could secure a favorable franchise either from the Bishop estate or from the Government. What influence the death of Mr. Lycurgus will have upon the early improvement of hotel accommodations is something that can not now be determined.

THE VOLCANO OBSERVATORY.

On the rim of the crater is located the Hawaiian Volcano Observatory, maintained by the United States Weather Bureau and the Volcano Research Association. This is in charge of Dr. T. A. Jagger, Jr., distinguished volcanologist. The observatory is equipped with the following instruments:

- 2 Bosch-Omori pendulums for high-speed registration of local earthquakes.
- 1 optically recording seismograph for distant earthquakes.
- 1 clinograph for registering east-west tilting of the ground.
- 1 vertical component seismograph.
- 1 rated chronometer.
- 1 transit.

Prof. Jagger is assisted by R. H. Finch, meteorologist. During the past year, in the interest of scientific research, Dr. Jagger visited New Zealand and the Samoan Islands, studying volcanoes and their products. I can not overestimate the importance of the work being done in the park by Dr. Jagger. Aside from its scientific value it is most interesting and instructive to tourists, and the observatory is always open to visitors. Whenever possible Dr. Jagger and Mr. Finch accompany groups of tourists to the active volcano and to other points about the park, pointing out almost at each step some new and interesting object relating to the volcanoes and the formation of the islands. Their knowledge of botany is also very extensive. In my opinion it should be the policy of the park service to do everything in its power to aid the work of the Weather Bureau and the Volcano Research Association. The results of their activities will wonderfully supplement what we are trying to do in other parks in the way of creating interest in their natural features from an educational standpoint.

THE KAU FLOW.

In December, 1919, some 6 miles from the active volcano in the Kilauea Crater, a lava flow burst forth from a rift leading directly from the lava lake. This flow in a short time built a hill 150 feet in height, and it is now considerably higher. It is dome shaped and is a miniature of Mauna Loa, and for this reason has been called Mauna Iki. This flow was particularly interesting because it illustrated the method by which the other great volcanic mountains of the islands were built up, and lava flowing from the top, then from the sides, building slowly but steadily.

From the standpoint of the tourist, however, the most interesting thing to see is the lava moving slowly over the desert, burning brush or cascading down the side of the newly built eminence. The Kau Flow was so named because the lava is running out over the Kau Desert.

This flow is not in the park but is in an area that should by all means be added to the park at an early date, together with a considerable area that has no commercial value, but which has an enormous scientific value, as well as numerous points of interest that will always be attractive to visitors. These include the great earthquake cracks and a section of the seacoast where great lava flows have poured into the ocean. The area also includes numerous craters and cones and desert flora, none of which duplicate features of the existing park.

THURSTON TUBES AND TWIN CRATERS.

When the park was created the lines were drawn in such a way that the Thurston Tubes and Twin Craters were excluded. The Thurston Tubes are ancient lava tubes of tremendous interest to tourists. One can walk through these tubes for a considerable distance far below the surface of the earth. An entrance to the tubes is in one of the Twin Craters. These craters have long been extinct and are now covered from top to bottom by an extremely beautiful growth of ferns and other tropical plants. These features should by all means be added to the park when the boundaries are extended.

RECOMMENDATIONS REGARDING KILAUEA SECTION.

The following is a brief statement of my recommendations regarding the Kilauea section:

- 1. That the Federal Government aid the Territory of Hawaii in building a concrete road to and through the park area.
- 2. That appropriations be made immediately for the protection of the Kilauea section of the park, the establishment of an information office, and the maintenance of existing roads and trails.
- 3. That legislation be enacted removing the inhibition on the annual appropriation of more than \$10,000 without special authority of Congress.
- 4. That as soon as the exchange transactions are closed and the private lands involved are made part of the park, grazing be prohibited.

5. That hotel and camp facilities be very greatly extended and improved.
6. That the National Park Service cooperate in every possible way with the Volcano Research Association and the United States Weather Bureau in advancing scientific studies of the volcanoes and do all possible to interest tourists in the educational advantages of the park and its observatory.
7. That the park be extended to include the region of the Kau Flow, the earthquake cracks, and adjacent areas, as well as the Thurston Tubes and Twin Craters.
8. That through Post Office Department channels authority be secured for the naming of the park post office Kilauea, Hawaii. It is now called Volcano House, because on the Island of Kauai there is a very small village with a post office called Kilauea. The name should be restored to the park area.

MAUNA LOA SECTION.

The Mauna Loa section of the park includes the summit of the mountain Mauna Loa (altitude, 13,675 feet), the second highest mountain in the Territory. It is exceeded only in Mauna Kea (altitude, 13,825 feet), which is a great extinct volcano in the north central part of the Island of Hawaii.

The central feature of this section of the park is the crater Mokuawewewo, from which many famous eruptions have taken place. However, leading from the crater itself and in the region just below are several rifts of great scientific interest. From these rifts, which in many cases are highly colored, numerous lava flows have issued, among them the great flow of 1881 which nearly destroyed the city of Hilo. In the line of these rifts are many spatter cones and other peculiar phenomena that attract and hold the attention of the tourist.

As already stated, the private holdings in this section of the park have already been acquired by the Government through gift by the Parker estate and the Bishop estate.

TRAILS TO MAUNA LOA.

This park area may be reached by any one of three trails. The best and most generally used trail leads from the Kilauea section over several large pahoehoe (smooth) lava flows, first to a magnificent observation point called Puu Ulaula (Red Hill), where the rest house, already mentioned, is located. This rest house cost \$3,000, raised by public subscriptions. It is fully equipped with rough furniture, stoves, cooking utensils, etc. It also has a water tank and stable as part of the plant.

Puu Ulaula is about 20 miles from the Kilauea Crater and is between 10 and 12 miles below the summer crater Mokuawewewo. The trail is passable for horses as far as Puu Ulaula, but not very safe for anything but pedestrian traffic beyond that point. However, during the past summer at least one party ascended to the summit with horses.

The trail was built by members of a company of the Twenty-fifth Infantry (colored), under the command of Capt. Bates, the Matson Navigation Co., the Inter-Island Steamship Co., and the Hilo Railroad Co., cooperating in furnishing free transportation for the soldiers and the necessary supplies and equipment. The trail is built on a good grade, but many improvements could be made in it. It could be made shorter and wider, and it could and should be better marked and made available for horse travel to the very summit of Mauna Loa.

Another trail ascends to the Mauna Loa Park area from the Kapapala ranch, and begins about 10 miles from the Kilauea Crater. This is a very old trail, on public land. While this is the easiest route to the top of the mountain, it lacks interesting natural features and has nothing at all to commend it to tourists.

A third trail, called the "Kona Trail," ascends the west side of Mauna Loa and has nothing of interest to make it worth developing in connection with the park.

Summarizing, the three trails in the order described are (1) the Puu Ulaula Trail, (2) the Kapapala Trail, and (3) the Kona Trail.

REST HOUSE ON MAUNA LOA.

It will never be necessary to expend much money in the Mauna Loa section of the park. A commodious and well-equipped rest house, with stable, water tank, and other appurtenances, is its greatest need. Such a shelter station should have private rooms for the storage of scientific instruments and to afford accommodations for visiting scientists.

ROAD TO THE SUMMIT.

In the not far distant future I believe the service will find it advisable to do all it can to have a road built to the summit crater of Mauna Loa, and at least to Puu Ulaula, utilizing the authority contained in the organic act to acquire a strip of land connecting the Kilauea section with the Mauna Loa section as a right of way. My observations convinced me that such a road is entirely feasible, and I do not believe it would cost an exorbitant sum of money. It could be built through a-a lava flows, which are composed of natural road material, requiring only heavy rolling and shaping. At any rate, I believe that as soon as possible the National Park Service should cause a survey to be made to get exact data regarding the route for such a road and the cost thereof. As this road would open up Bird Park and a great Koa forest in the Kilauea section, as well as the Mauna Loa volcanic phenomena, the project is worthy of early consideration.

THE ALIKA FLOW.

In October, 1919, a great flow of lava from the west side of Mauna Loa took place. It began in a rift well up toward the summit, and sweeping its way through virgin forests below finally reached the sea, where it pushed up a sand cone of great dimensions. It was called the Alikā flow, because it passed over the Alikā section of South Kona. It destroyed 1,800 linear feet of the main highway around the island.

This point was interesting, as it gave me an opportunity to see how a road is constructed through a-a lava and how much roads of this character cost under present-day prices. The road was replaced through the Alikā Flow at a cost of \$7,758, or at the rate of approximately \$20,000 per mile. It must be understood, however, that the road was a

main highway distant from seaports and centers of labor and material supplies and had to be built as an emergency project in order to reestablish communication along the west side of the island. Furthermore, the ground was hot when the road was rebuilt, and was even warm when I visited the Alike Flow early in March, some six months after the lava began to cool.

I also visited other roads built through Mauna Loa lava flows, and was particularly struck by the fact that the roads through the great 1907 and other flows of earlier dates were built at very reasonable costs. They are oil macadam highways built in 1912 at a cost of about \$6,000 per mile.

From these figures I should think that the road up Mauna Loa should not cost more than \$10,000 per mile, or \$300,000 for the project.

RECOMMENDATIONS REGARDING MAUNA LOA SECTION.

The following is recommended for consideration when plans for development of this section are taken up:

1. That a rest house fully equipped be established at the crater of Mokuaweoweo, the summit crater of Mauna Loa.
2. That the present trail to the summit be improved and made safe for horse travel.
3. That surveys be conducted for the purpose of determining the feasibility and cost of a road from the Kilauea section to the summit crater.

ISLAND OF HAWAII GREAT TOURIST RESORT.

It is only fair to remark before advancing to the Haleakala section of the park that, aside from the park area, on the island of Hawaii, there are a great many other exceedingly interesting points. The city of Hilo itself, situated on a beautiful bay, is a veritable garden of ferns and flowers. Back of it there are the remarkable Rainbow Falls on the Waialuku River, and northward a few miles is the Onomea Arch, a great natural arch in a peninsula reaching out to sea. All about the city are sugar plantations. Then there are the extensive forests, queer lava formations, and ancient heiaus or temples of the Puna district, the coffee plantations, heiaus, and beautiful marine scenes of Kona, the great lava flows of Kau, the extensive ranch lands and irrigated districts of Kohala, the Kohala Mountains, Mauna Hualalai (altitude 8,269) and Mauna Kea (altitude 13,825), and the green cane fields of the windward coast in the districts of Hamakua and Hilo, all connected by the belt road around the great island. No visitor should omit the trip around the island of Hawaii. It is certainly one of the great automobile tours of the world. Three days should be devoted to this trip. After leaving the park, assuming that the tourist goes southward, he should spend the first night in Kona. There are two hotels. Miss Paris's hotel at Kealahakua, and at Hualaloa an establishment of about the same size as Miss Paris's hotel. The second night should be spent at Waimea in Kohala, and the third in Hilo, the metropolis of the island and the gateway to the national park.

HONAUNAU, THE CITY OF REFUGE.

On the Kona coast just south of Napoopoo and only a short distance from Miss Paris's hotel at Kealahakua is Honaunau, rich in historic sentiment. Here was located the great city of refuge, an enormous temple of stone, now partly in ruins. However, the structure is still considered the best preserved of all the ancient buildings of the islands. Not only is this place interesting because it was used as a refuge in time of trouble and for religious rites, but also because it illustrates marvelous feats of strength in a time when there was no machinery available to aid in the construction of buildings. Tremendous rocks were placed in the temple walls by hand. Also, there are many peculiar stones in the structure that have intensely interesting histories.

The Honaunau ruin should be made a national monument under the act of June 8, 1906, and should be forever preserved by the United States Government just as many of our cliff dwellings and other historic places have been safeguarded here. It is in private hands now, but I feel sure that it would be donated to the United States if the owners could be assured that the ancient temple would be cared for.

HALEAKALA SECTION.

The second largest section of the park is the Haleakala section, on the island of Maui. It includes the crater of the extinct volcano Haleakala, which rises to an altitude of 10,032 feet. This crater is one of the largest in the world, and it certainly beggars description. It has a circumference of about 20 miles and is several thousand feet deep in places. It has an area of 19 square miles, or 12,160 acres.

In the crater are hundreds of cones and great lava flows of absorbing interest. At the southeast and northwest sections of the crater there are low gaps out of which great rivers of lava once flowed. The southeast gap is called Kaupo Gap, and the other Koolau Gap. Near each gap is a beautiful meadow with plenty of grass for saddle and pack horses, and mamani trees for shade. These meadows are in private hands and are about the only areas that the park should ultimately acquire, aside from certain rights of way for roads and trails.

The lands are owned by the Haleakala Ranch Co., and one of the officers of the company assured me that when the park service desired to develop one or both of these meadows the company would convey, under the new exchange law, enough of the areas to make it possible for us to care properly for tourists. In the meantime they, the company, will continue to let visitors use the meadows as they are. The prettiest of the meadows is at Paliku, near Kaupo Gap, and lies immediately under the east wall of the crater.

TRAIL TO HALEAKALA.

The point of departure for this section of the park is Waialuku, the principal city of the island of Maui. From this point automobiles are taken to Olinda, a beautiful settlement of summer homes on the slopes of Haleakala at an altitude of 4,043 feet. The distance by road from Waialuku to Olinda is about 20 miles, and it takes about two hours to make the trip. At Olinda saddle horses must be procured for the summit trip. This

saddle-horse trip requires almost three and a half hours. At the summit a fine new concrete rest house may be used free of charge. This was built by subscriptions of funds by citizens of Maui. It is fully equipped with tiers of iron beds, blankets, stoves, and cooking utensils. It is the finest rest house I have ever seen.

The horses that are kept at Olinda are owned by Mr. Worth Aiken, a prominent citizen of Maui, who engages in this business solely for the purpose of affording visitors a chance to go to the top of the mountain that he, as a lover of nature and outdoor sports, regards as one of the greatest mountains of the world, which it is. Not only does he aim to furnish horses practically at cost, but he also permits his summer home at Olinda to be used as a base from which to depart for the summit.

VISIT TO MAUI.

I landed at Lahaina, the ancient capital of the islands, and from that point proceeded to Wailuku, where there are several good hotels. From this point I made a trip to Iao Valley, a beautiful gorge in the mountains of West Maui, which will some day be a great tourist resort. The trees, ferns, and flowers growing in this gorge were unusually luxuriant. In some respects this canyon resembles the Yosemite Valley.

Leaving Wailuku for Haleakala the road takes its course past the Puunene sugar mill, one of the largest in the world. This road I followed en route to Olinda, and returned via another route. I spent one night in the summit rest house, and one night in the crater of Haleakala, near Kaupo Gap.

Had time permitted I would have ridden over the trails around the mountain. One of these trails is the famous Koolau Ditch Trail along the windward coast. The best trip of all for tourists to make is the one that gives them both the crater view and the Koolau Ditch scenery. Briefly, the trails to be traversed in this trip take the following route: Olinda to the summit rest house, thence through the crater to Kaupo Gap, thence to Hana on the northeast point of the island, thence to Keanae, thence to Wailuku. The trip requires five days of horseback riding. Most of this series of connecting trails lies outside the park area.

When the National Park Service has not only enough funds available to properly care for the Kilauea section of the park but also for improvements in the Haleakala region, one of the first things it should do would be to build a trail through Koolau Gap from the present trail in the crater to the Keanae Valley ditch camp on the Ditch Trail. This would afford a splendid three-day trip that would be within the means of the average tourist. I think this trail was first suggested by Supt. Roger W. Toll, of Mount Rainier Park, who visited the Hawaiian Islands in the spring of 1919. In his report of May 1, 1919, he describes the proposed trail as follows:

"This trail should run from the Rest House to the floor of the crater, then out through the Koolau Gap, and either down the eastern rim of the valley or down the valley itself. The latter would probably be the more attractive route on account of the striking cliffs on the western side of the valley and the fact that there are streams in the valley. In order to reach the crater floor from the Rest House, there are two alternate locations for the trail. It could follow the present route west of the rim toward White Hill, descend into the crater on the sand slope (as the present route does), then pass between some of the cone craters and go to the Koolau Gap. Another shorter route would be to build the trail, starting down to the crater floor from the Rest House. This would involve some rock work, but the slope is not so precipitous as one might think when looking from the rim at the Rest House. This route would reach the cones on the crater floor by a much more direct route and might be preferable since much work would have to be done to make a satisfactory trail along the present route to the crater floor.

"The distance on horseback would be about as follows: First day, Olinda to Rest House, 8 miles; second day, Rest House to Keanae Ditch Camp, 20 miles; third day, Ditch Camp to Kailua, 12 miles; total, 40 miles.

"The automobile part of the trip, namely, from Wailuku to Olinda, and from Kailua to Wailuku, would be the same as at present for the Haleakala and Ditch Trail trip. The guide that I had said he had been down from the crater through the Koolau Gap, on foot to Keanae, and he did not believe there were any serious difficulties to the construction of a trail over this route."

DEVELOPMENT OF HALEAKALA PARK.

Ultimately a road should be built from Olinda to the summit of Haleakala in order that everybody may make the ascent in comfort and enjoy the wonderful effects of sunset and sunrise to be observed from the crater's rim. Such a road would cost a large sum of money, but it is no more than Hawaii deserves, considering the fact that she has not had a share in the benefits of the Federal-aid road act.

The existing roads should be kept in repair and means should be found to prevent the destruction of the beautiful silversword plant which now grows in no place outside of the Haleakala crater. When possible a rest house should be built near Kaupo Gap.

RECOMMENDATIONS.

Summing up my recommendations in regard to the Haleakala section, they are as follows:

1. That the service should keep in mind the advisability of building a road to the rim of the crater and make the necessary surveys for the same.
2. That the destruction of the silversword plant be discouraged in every possible way, but through a campaign of education in the value of the plant to the park I believe the best results can be obtained.
3. That when funds are available a new trail be built from the crater through Koolau Gap to the Ditch Trail.
4. That the trails to and through the crater be improved and extended.
5. That a rest house be built near Kaupo Gap.

OTHER TRIPS ON MAUI.

As in the case of the island of Hawaii, the traveler who visits Maui will find several interesting trips outside of the park. I have already mentioned Iao Valley, the

Koolau Ditch Trail, and other trails about Haleakala. In addition to these, a beautiful trip can be taken along the coast of West Maui where there are some thrilling pali or cliffs. The trip to Lahaina from Walluku is one of the finest automobile trips to be had anywhere, combining ocean shore scenes first with cane and pineapple fields, and then with the mountains that tower above the old city of Lahaina as the tour nears its end.

GENERAL RECOMMENDATIONS.

In addition to the recommendations made regarding the several park areas, I have the following to offer as general suggestions:

1. All park areas are greatly in need of appropriate direction signs, and it would seem that the service, as soon as appropriations are available, should adopt a plan for the progressive marking of all points of interest in the park and erect milepost signs along the roads and trails.

2. A circular of detailed information regarding the park should be issued. This circular should briefly describe the scenic and scientific points, the means of reaching the park, quoting rates, etc. It should also have an up-to-date map. It will be possible in a few years to obtain a topographic map of the park areas, as the Territory of Hawaii and the United States Geological Survey are now cooperating in a project that contemplates the completion of the mapping of all the larger islands. Kauai and Oahu are already completely mapped, and part of the Hawaii quadrangles have been finished.

WAIMEA CANYON, KAUAI.

For several years prominent citizens of the islands have suggested that Waimea Canyon, on the island of Kauai, be inspected with a view to determining its suitability for national-park purposes. I made such an inspection on the occasion of my Hawaii trip. Leaving Honolulu late in the afternoon on the steamer *Kineo*, I reached the port of Nawiliwili about 1 o'clock the following morning and proceeded by automobile to Waimea, a small village on the south shore of the island.

From Waimea the trip to the great canyon was made by automobile and saddle horse. I found the canyon to be an almost perfect miniature of the Grand Canyon of the Colorado, except that there were more trees and shrubs growing in its walls than there are in the Grand Canyon. The scenery in and about the canyon is beautiful. Several high waterfalls add greatly to its charm.

Above the canyon the Territory has established a forest reserve which is well protected. From the Kokee ranger station in this reserve guards can easily look after the welfare of the canyon. The county of Kauai has, furthermore, established a park along the west rim of the canyon, this to be used primarily by citizens of the island. The only danger to the region lies in the possibility that the county may permit the erection of unsightly summer homes along this rim. This is something that should be carefully guarded against.

I examined the Waimea Canyon and its adjacent region very carefully, but came to the conclusion that nothing could now be gained by adding this scenic territory to the park. It will keep for further consideration after the existing national park areas have been improved. Furthermore, the lack of adequate docking facilities at Nawiliwili and all other Kauai ports causes travel to this island to be inconvenient and uncomfortable. Until proper docks are built and adequate boat service is established nothing could be done to make Waimea Canyon popular as a tourist resort.

KAUAI, THE GARDEN ISLE.

Kauai is a beautiful island and has many attractions for the tourist. The Barking Sands beyond Waimea, the wonderful canyons of the Napali, the rocky western coast of the island, the Spouting Horn near Koloa, a "blow hole" on the shore, through which the water of the ocean is thrown up like a geyser, Kukulolono Park, a private park of great beauty developed by Mr. W. D. McBryde and thrown open for public use, the Waialeale Falls, near Lihue, the largest town of the island, the charming valley of Hanalei and the beach where the river enters the ocean, and a dozen other vastly different features are among these attractions.

The roads of this island are the best in the Territory, and it is on this account a paradise for motorists who can afford to have their machines shipped there for use.

I was much impressed with Kauai, and some day I predict that it will be as popular with tourists as any other island.

HONOLULU.

No report on Hawaii National Park would be complete without a statement regarding the relation of Honolulu to the park. This great and beautiful city is the metropolis of the islands and the capital of the Territory. It is the industrial, social, and educational center of the group. All local and trans-Pacific steamers make this a port of call. Situated on the island of Oahu, an island possessing many distinctive and unique natural features, it would be a tourist resort for this reason alone. But it is the starting point for trips to other islands. People spend a few days at Honolulu, then go on to other islands, particularly Hawaii and Maui, then return for longer sojourns at Waikiki or in other sections of the city. Invariably they take a trip around the island over the scenic roads, and no one misses the amazing view from Nuuanau Pali, or "The Pali," as it is generally called. The Pali Road is one of the scenic highways of the world.

HONOLULU HOTELS.

Three big hotels in or near the city also give it prestige as a resort. The Moana and Seaside are at Waikiki Beach and the Alexander Young is in the heart of the city. All are first-class hotels and have been maintained in the best of condition all through the war and subsequent thereto despite heavy losses due to lack of patronage. Had these hotels been operated in almost any place other than the Territory of Hawaii, they would have been closed or sold for other purposes, but the business men of the islands take a

great pride in their native land, and the owners of these hotels, despite their losses, have kept them all running in order that every visitor may be sure of having on the island the highest-grade service. The hotels represent an enormous investment, and I believe that they deserve the consideration of the National Park Service in getting out literature regarding the Hawaii Park. Without these hotels the islands could never become a great tourist resort, and should they be closed for any reason, the entire Territory, including the park, would be gravely injured.

VALUABLE ASSISTANCE RECOGNIZED.

In closing this report I wish to express my appreciation of the courtesies and aid extended to me by Gov. C. J. McCarthy and Col. C. P. Iaukea, secretary of the Territory; by Mr. Charles S. Judd, territorial forester, who accompanied me on my entire tour, and who from his vast knowledge and experience in the islands was able to enlighten me on many subjects relating to the park areas; by Mr. C. T. Bailey, land commissioner of the Territory, who conducted the negotiations regarding the park land exchange; by Mr. L. A. Thurston, who at the Denver conference and in California gave me much valuable advice regarding my Hawaii work; by the Bishop estate trustees, who did all in their power to expedite the land exchanges, and who took at all times a high patriotic view of all park problems affecting the private lands of the estate in the park areas, while strictly observing the obligations imposed upon them as trustees of the property; by Chairman G. S. McKenzie, Mr. Emil Berndt, and other members of the Hawaii Tourist Bureau; by Mr. George Vicars and Mr. L. W. de Vis Norton, of the Hawaii Publicity Commission and Hilo Board of Trade, as well as other members of the Hilo Trade Board; by Mr. Worth Aikin, Senator H. A. Baldwin, Mr. Frank Baldwin, and Mr. W. A. Clark, of Maui, who rendered valuable aid in connection with the Haleakala inspection; by Mr. W. H. Rice, Jr., of Kuaui; by Judge Sanford B. Dole, ex-President of the Republic of Hawaii and first governor of the Territory; by Dr. T. A. Jagger and Mr. E. H. Finch, of the Volcano Observatory; by the officers of the Pan Pacific Union; and by the officers and members of the Trail and Mountain Club of Hawaii. All of these individuals and organizations are deeply interested in our park problems, and the National Park Service should, in my opinion, keep in close touch with them.

FINIS.

In Hawaii National Park, America has gained a priceless possession. It takes rank at once with the finest of our public playgrounds, and its development should be a task of fascinating interest.

APPENDIX C.

STATISTICS.

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STATISTICS.

Visitors to parks, 1908-1920.

Name of park.	1908	1909	1910	1911	1912	1913	1914
Hot Springs Reservation.....	(1)	(1)	¹ 120,000	¹ 130,000	¹ 135,000	¹ 135,000	¹ 125,000
Yellowstone National Park.....	19,542	32,545	19,575	23,054	22,970	24,929	20,250
Sequoia National Park.....	1,251	854	2,407	3,114	2,923	3,823	4,067
Yosemite National Park.....	8,850	13,182	13,619	12,530	10,884	13,735	15,145
General Grant National Park.....	1,773	798	1,178	2,160	2,240	2,756	3,735
Mount Rainier National Park.....	2,826	5,968	8,000	10,306	8,946	13,501	15,038
Crater Lake National Park.....	5,275	4,171	¹ 5,000	¹ 4,500	5,235	6,253	7,096
Wind Cave National Park.....	¹ 3,171	¹ 3,216	¹ 3,387	¹ 3,887	¹ 3,199	¹ 3,988	¹ 3,592
Platt National Park.....	¹ 26,000	¹ 25,000	¹ 25,000	¹ 30,000	¹ 31,000	¹ 35,000	¹ 30,000
Sullys Hill National Park.....	¹ 250	¹ 190	¹ 190	¹ 200	¹ 200	¹ 300	¹ 500
Mesa Verde National Park.....	¹ 80	165	250	206	230	280	502
Glacier National Park.....				¹ 4,000	6,257	12,138	14,168
Rocky Mountain National Park.....							
Hawaii National Park.....							
Lassen Volcanic National Park.....							
Mount McKinley National Park.....							
Grand Canyon National Park.....							
Lafayette National Park.....							
Zion National Park.....							
Total.....	69,018	86,089	198,606	223,957	229,084	251,703	235,193

Name of park.	1915	1916	1917	1918	1919	1920
Hot Springs Reservation.....	¹ 115,000	¹ 118,740	¹ 135,000	¹ 140,000	¹ 160,490	¹ 162,850
Yellowstone National Park.....	51,895	35,849	35,400	21,275	62,261	79,777
Sequoia National Park.....	7,647	10,780	18,510	15,001	30,443	31,508
Yosemite National Park.....	33,452	33,390	34,510	33,497	58,362	68,906
General Grant National Park.....	10,523	15,360	17,390	15,496	21,574	19,661
Mount Rainier National Park.....	35,166	23,989	35,568	43,901	55,232	56,491
Crater Lake National Park.....	11,371	12,265	11,645	13,231	16,645	20,135
Wind Cave National Park.....	2,817	¹ 9,000	16,742	14,431	26,312	27,023
Platt National Park.....	¹ 20,000	¹ 30,000	¹ 35,000	¹ 36,000	¹ 25,000	¹ 38,000
Sullys Hill Park.....	¹ 1,000	¹ 1,500	2,207	4,188	4,026	9,341
Mesa Verde National Park.....	663	1,385	2,223	2,058	2,287	2,890
Glacier National Park.....	14,265	12,839	18,387	9,086	18,956	22,449
Rocky Mountain National Park.....	¹ 31,000	¹ 51,000	¹ 117,186	¹ 101,497	¹ 169,492	¹ 240,966
Hawaii National Park.....		(1)	(1)	(1)	(1)	(1)
Lassen Volcanic National Park.....		(1)	¹ 8,500	¹ 2,000	¹ 2,500	¹ 2,000
Mount McKinley National Park.....			(1)	(1)	(1)	(1)
Grand Canyon National Park.....					37,745	67,315
Lafayette National Park.....					¹ 64,000	¹ 66,500
Zion National Park.....						3,692
Total.....	334,799	356,097	488,268	451,661	755,325	919,504

¹ No record.

¹ Estimated.

Visitors to some of the national monuments in 1919-20.¹

Name.	1919	1920
Capulin Mountain (New Mexico).....	\$ 1,500	\$ 3,200
Casa Grande (Arizona).....	3,677	7,720
Colorado (Colorado).....	\$ 3,000	\$ 1,200
El Morro (New Mexico).....		\$ 2,000
Montezuma Castle (Arizona).....		\$ 2,500
Muir Woods (California).....	\$ 43,200	\$ 77,577
Navajo (Arizona).....		64
Papago Saguaro (Arizona).....		\$ 5,000
Petrified Forest (Arizona).....	\$ 3,000	\$ 30,390
Scotts Bluff (Nebraska).....		\$ 5,000
Tumacacori (Arizona).....		\$ 4,300
Zion (Utah) ²	1,814	
Total.....	56,191	138,951

¹ No records for other 13 national monuments.² Estimated.³ Created a national park Nov. 19, 1919.*Automobile and motor cycle licenses issued during seasons, 1916-1920.*

Name of park. ¹	1916		1917		1918		1919		1920 ²	
	Automobiles.	Motor cycles.	Automobiles.	Motor cycles.	Automobiles.	Motor cycles.	Automobiles.	Motor cycles.	Automobiles.	Motor cycles.
Yellowstone.....	3,430		5,326		4,447	16	9,543	38	13,238	85
Sequoia ³	731	4	952		766	2	1,665	6	2,019	13
Yosemite.....	3,932		5,320		5,554	59	10,093	94	10,112	126
General Grant.....	1,730	41	2,267		2,350	27	2,982	26	4,350	37
Mount Rainier.....	2,973	99	5,906	108	7,353	122	8,949	113	9,402	99
Crater Lake.....	2,051	29	2,094	15	1,959	5	3,196	14	3,783	19
Mesa Verde.....	178		368		338		464		548	5
Glacier.....	511	11	1,292		1,066	2	1,694	1	531	
Total.....	15,536	186	23,525	123	23,833	233	38,586	292	43,983	384

¹ No licenses required for Wind Cave, Hot Springs, Platt, Hawaii, Lassen Volcanic, Sullys Hill, Rocky Mountain, Grand Canyon, and Lafayette National Parks. No roads in Mount McKinley Park.² Number of licenses formally reported to Washington, to and including Sept. 30, 1920.³ Licenses required only for Giant Forest Road.⁴ Includes 5,360 autos in 1919 and 1,419 autos in 1920, the owners of which surrendered Yosemite Valley Highway Association certificates in lieu of payment of entrance fee.

Licenses not required in certain parks because of small road mileage or unimproved condition of roads (see footnote 1). Licenses also not required for travel on unimproved roads in other parks. No charge for license issued for operating cars on official business.

Receipts collected from automobiles and motor cycles during seasons, 1916-1920.

Name of park. ¹	1916	1917	1918	1919	1920 ²
Yellowstone.....	\$25,387.50	\$39,945.00	\$33,392.50	\$71,337.50	\$99,015.00
Sequoia ³	1,600.00	2,380.00	1,920.00	4,134.50	5,030.00
Yosemite.....	19,885.00	26,600.00	27,888.00	23,474.00	43,352.00
General Grant.....	957.50	1,133.50	1,188.50	1,504.00	2,180.50
Mount Rainier.....	13,194.00	14,181.50	18,225.50	22,167.00	23,587.50
Crater Lake.....	4,402.00	5,253.00	4,902.50	7,991.50	9,454.00
Mesa Verde.....	95.50	184.00	338.00	674.00	824.50
Glacier.....	312.00	1,292.00	1,068.00	2,665.00	450.00
Total.....	65,833.50	90,969.00	88,923.00	133,947.50	183,893.50

¹ No licenses required for Wind Cave, Hot Springs, Platt, Hawaii, Lassen Volcanic, Sullys Hill, Rocky Mountain, Grand Canyon, and Lafayette National Parks. No roads in Mount McKinley Park.² Received in Washington to and including Sept. 30, 1920.³ License required only for Giant Forest Road.

Private automobiles entering the national parks during seasons, 1916-1920.

Name of park.	1916	1917	1918	1919	1920 ¹
Yellowstone.....	3,445	5,703	4,734	10,737	13,586
Sequoia ²	736	2,334	1,027	3,852	5,657
Yosemite.....	4,043	6,521	7,621	12,109	13,418
General Grant.....	1,778	2,158	2,438	3,366	4,710
Mount Rainier.....	3,070	5,894	7,602	10,434	10,514
Crater Lake.....	2,649	2,756	3,105	4,637	5,158
Wind Cave ³	4,500	4,837	4,815	8,240	7,086
Mesa Verde.....	185	364	371	436	570
Glacier.....	802	1,121	1,065	1,697	2,009
Rocky Mountain ⁴	4 10,060	4 23,004	4 20,588	4 33,638	4 50,552
Grand Canyon ⁵				1,575	3,260
Lafayette ⁶				4,000	4 10,000
Zion ⁶					644
Total.....	29,358	54,692	53,906	97,721	128,074

¹ Automobiles entering parks with or without licenses, to and including Sept. 30, 1920.² License required only for Giant Forest Road.³ No license required.⁴ Estimated.*National park and monument areas administered by the National Park Service in relation to the States and Territories in which they are located.*

State or Territory.	Area.	Parks and monuments.	Relation.
	<i>Acres.</i>	<i>Acres.</i>	<i>Per cent.</i>
Alaska.....	378,165,760	2,416,857	0.63
Arizona.....	72,838,400	641,073	.88
Arkansas.....	34,134,400	912	.003
California.....	99,617,280	953,276	.96
Colorado.....	66,341,120	295,500	.44
Hawaii.....	1 3,100,320	34,295	1.08
Idaho.....	53,346,560	23,040	.04
Maine.....	21,145,600	5,000	.02
Montana.....	96,508,640	1,092,263	1.16
Nebraska.....	49,157,120	2,054	.004
New Mexico.....	78,485,760	21,950	.03
North Dakota.....	44,917,120	1,033	.002
Oklahoma.....	44,636,480	1,848	.002
Oregon.....	61,138,480	156,902	.25
South Dakota.....	49,673,600	10,890	.02
Utah.....	52,597,760	69,922	.13
Washington.....	42,775,040	207,342	.48
Wyoming.....	62,460,160	1,994,322	3.17

¹ Area of the Islands of Hawaii and Maui on which are located the Hawaii National Park.

National park and monument areas administered by the National Park Service in relation to the public lands.¹

State or Territory.	Public lands. ²	Parks and monuments. ²	Relation.
	<i>Acres.</i>	<i>Acres.</i>	<i>Per cent.</i>
Alabama.....	86,761		
Alaska.....	373,494,965	2,416,857	0.64
Arizona.....	30,277,614	641,073	2.11
Arkansas.....	1,193,156	912	.07
California.....	39,430,238	953,276	2.41
Colorado.....	22,510,872	295,500	1.31
Florida.....	428,405		
Georgia.....	107,745		
Hawaii ³	1,634,539	34,285	2.09
Idaho.....	27,510,183	23,040	.08
Kansas.....	4,346		
Louisiana.....	14,240		
Maine.....	32,060	5,000	15.59
Michigan.....	162,989		
Minnesota.....	1,308,041		
Mississippi.....	33,360		
Missouri.....	18		
Montana.....	23,108,825	1,092,263	4.72
Nebraska.....	274,842	2,054	.74
Nevada.....	59,252,241		
New Hampshire.....	355,472		
New Mexico.....	26,778,862	21,950	.08
North Carolina.....	259,112		
North Dakota.....	82,077	1,033	1.25
Oklahoma.....	69,732	848	1.21
Oregon.....	27,275,587	156,902	.57
South Carolina.....	18,454		
South Dakota.....	1,385,042	10,899	.78
Tennessee.....	113,724		
Utah.....	37,476,333	69,922	.18
Virginia.....	310,011		
Washington.....	11,233,917	207,342	1.85
West Virginia.....	98,527		
Wisconsin.....	5,154		
Wyoming.....	30,142,114	1,994,322	6.61
Total.....	716,464,549	7,927,488	1.10

¹ Includes vacant public lands, national parks and monuments, and national forests, but does not include military and Indian reservations, reclamation and power site withdrawals, etc.

² July 1, 1920.

³ Public lands of the Territory of Hawaii are under the Territorial land department.

National park and monument areas administered by the National Park Service in relation to the national forests, including national monuments administered by the Forest Service.

State or Territory.	National forests. ¹	Parks and monuments. ¹	Relation.
	<i>Acres.</i>	<i>Acres.</i>	<i>Per cent.</i>
Alabama.....	² 49,561		
Alaska.....	20,579,740	2,416,857	11.07
Arizona.....	11,367,632	641,073	5.63
Arkansas.....	² 915,649	912	.09
California.....	18,891,161	953,276	5.46
Colorado.....	13,274,187	295,500	2.23
Florida.....	308,408		
Georgia.....	107,745		
Hawaii.....		34,285	
Idaho.....	18,682,081	23,040	.12
Maine.....	27,060	² 5,000	18.47
Michigan.....	89,466		
Minnesota.....	1,046,744		
Montana.....	15,942,821	1,092,263	6.85
Nebraska.....	205,944	2,054	.99
Nevada.....	4,985,066		
New Hampshire.....	353,472		
New Mexico.....	8,308,434	21,950	.26
North Carolina.....	259,112		

¹ July 1, 1920.

² Includes lands acquired under the Weeks law.

³ Donated to the United States. Other donations of lands in national monument areas amount to 465 acres.

National park and monument areas administered by the National Park Service in relation to the national forests, etc.—Continued.

State or Territory.	National forests.	Parks and monuments.	Relation.
	<i>Acres.</i>	<i>Acres.</i>	<i>Per cent.</i>
North Dakota.....	61,480	1,083	
Oklahoma.....	13,111,928	848	1.37
Oregon.....	12,443	156,902	1.19
Porto Rico.....	18,454		
South Carolina.....	1,085,671	10,809	1.04
South Dakota.....	113,724		
Tennessee.....	7,414,696	60,922	.94
Utah.....	310,011		
Virginia.....	9,939,889	207,342	2.80
Washington.....	98,527		
West Virginia.....	8,468,197	1,994,322	23.55
Wyoming.....			
Total.....	156,082,063	7,927,488	5.08

Statement of appropriations made for, and revenues received from, the various national parks and national monuments, and expenditures made therefrom during the fiscal years 1904-1920, inclusive; also appropriations for the fiscal year 1921.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Hot Springs Reservation:				
1904.....	\$36,050.00	(1)	\$18,430.00	(1)
1905.....	8,000.00	(1)	19,330.00	(1)
1906.....	6,000.00	(1)	19,748.33	(1)
1907.....			20,165.00	\$19,938.41
1908.....			28,090.00	21,115.56
1909.....			34,475.00	19,699.27
1910.....			36,640.00	28,401.97
1911.....	2,935.00	\$2,935.00	36,080.00	56,375.33
1912.....			\$2,518.00	
			35,279.16	3,267.96
1913.....				\$42,937.18
				\$29,438.25
			40,711.00	\$34,561.57
1914.....			\$1,287.90	\$1,273.70
1915.....			38,330.00	\$36,658.62
1916.....			37,877.66	36,941.96
1917.....			37,926.32	40,261.14
1918.....			35,611.75	31,302.96
1919.....	\$140,000.00	58,660.36	28,863.44	\$2,522.02
1920.....			52,109.15	32,130.36
			45,682.85	35,710.33
Yellowstone:				
1904.....	8,940.30	(1)		
1905.....	7,500.00	(1)		
1906.....	7,500.00	(1)		
1907.....	7,500.00		1,522.50	(1)
1908.....	8,000.00	7,498.64	1,838.98	3,647.04
1909.....	8,000.00	7,999.40	4,699.65	4,228.37
1910.....	\$8,000.00	7,997.44		
1911.....	\$2,500.00	1,962.53	4,790.20	3,661.47
1912.....	8,000.00	7,999.71	5,110.05	3,359.80
	8,500.00	8,499.96	23,420.13	7,998.47
	8,500.00	8,500.00	16,476.38	8,103.41

¹ Figures not available.

² Proceeds from sale of Government lots (lot fund).

³ Expenditures from lot fund.

⁴ Includes \$1,272.71 expended in making survey and preparation of plans, etc., for sewer system, city of Hot Springs.

⁵ Contributed by city of Hot Springs on account of sewer system, \$14.20 returned to city.

⁶ Includes 99 cents expended on account of survey sewer system.

⁷ Made available during fiscal years 1920 and 1921 by sundry civil acts approved July 19, 1919 (41 Stat., 204), and June 5, 1920 (Public No. 243, 66th Cong.).

⁸ Administration and protection.

⁹ Marking unmonumented portions of park boundaries.

Statement of appropriations made for, and revenues received from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Yellowstone—Continued.				
1913.....	\$8,500.00	\$8,500.00	\$21,980.10	\$6,449.97
1914.....	8,500.00	8,500.00	15,439.23	15,843.24
1915.....	8,500.00	8,500.00	20,307.40	12,884.18
1916.....	8,500.00	8,491.41	46,628.49	25,350.96
1917.....	8,500.00	8,500.00	54,795.69	53,775.61
1918.....	10,500.00	9,660.82	71,393.56	96,512.34
1919.....	334,920.00	330,234.19	42,776.50	(¹⁰)
1919.....	11 3,259.48	539.44		
1920.....	255,500.00	254,811.66	120,027.61	(¹⁰)
1920 (deficiency).....	71,026.64	71,026.64		
1921.....	278,000.00			
Sequoia:				
1904.....	10,089.69	(¹)		
1905.....	10,000.00	(¹)		
1906.....	10,000.00	(¹)		
1907.....	10,000.00	9,919.32	159.50	
1908.....	15,550.00	15,333.50	43.15	18.97
1909.....	15,550.00	15,373.96	46.57	
1910.....	15,550.00	15,514.19	121.78	
1911.....	15,550.00	15,543.34	255.65	31.26
1912.....	15,550.00	15,549.20	305.18	48.25
1913.....	15,550.00	15,549.52	353.85	70.51
1914.....	15,550.00	15,549.27	4,094.21	83.94
1915.....	15,550.00	15,549.65	1,975.03	3,498.23
1916.....	15,550.00	15,549.75	5,169.86	4,740.75
1917.....	22,300.00	15,605.28		
1917.....	12 50,000.00	50,000.00	10,326.60	415.04
1918.....	25,000.00	24,578.71	13,402.53	25,508.45
1919.....	30,510.00	30,417.48	9,772.52	(¹⁰)
1920.....	35,000.00	34,846.82	15,899.00	(¹⁰)
1921.....	36,000.00			
Yosemite:				
1904.....	6,000.00	(¹)		
1905.....	8,400.00	(¹)		
1906.....	25,400.00	(¹)	1,000.00	
1907.....	5,750.00	5,705.24	9,193.04	1,000.00
1908.....	30,000.00	29,508.58	14,390.06	7,131.37
1909.....	30,000.00	29,969.86	15,851.17	5,024.84
1910.....	30,000.00	29,983.82	21,373.18	34,488.09
1911.....	62,000.00	62,000.00	35,765.48	19,050.39
1911.....	12 12,000.00	12 11,646.37		
1912.....	50,000.00	49,999.68	23,855.77	35,970.68
1913.....	80,000.00	80,000.00	19,495.83	16,431.16
1914.....	125,000.00	124,798.49	23,406.14	9,903.58
1915.....	100,000.00	99,235.22	37,019.20	40,699.30
1916.....	75,000.00	74,996.88	49,878.42	52,961.53
1916 (deficiency).....	196.80	196.80		
1917.....	250,000.00	249,987.45	53,500.66	55,098.45
1918.....	235,000.00	226,388.29	65,865.65	88,975.62
1919.....	255,000.00	254,295.44	57,520.03	(¹⁰)
1920.....	200,000.00	199,973.96	85,601.54	(¹⁰)
1921.....	300,000.00			
General Grant:				
1904.....	2,058.65	(¹)		
1905.....	2,000.00	(¹)		
1906.....	2,000.00	(¹)		
1907.....	2,000.00	1,988.75		
1908.....	2,000.00	1,914.76		
1909.....	2,000.00	1,999.93	63.75	
1910.....	2,000.00	1,999.90	50.00	
1911.....	2,000.00	1,999.89	210.64	18.88
1912.....	2,000.00	1,998.60	173.54	99
1913.....	2,000.00	1,999.20	158.68	503.01
1914.....	2,000.00	2,000.00	429.64	1.59
1915.....	2,000.00	2,000.00	560.80	355.63
1916.....	2,000.00	1,999.36	1,795.50	481.46
1917.....	2,000.00	1,999.55	1,153.78	536.97
1918.....	2,000.00	1,999.97	1,801.63	3,951.88

¹ Figures not available.¹⁰ Expenditure of revenue for park purposes not authorized. Sundry civil act of June 12, 1917 (40 Stat., 153).¹¹ Unexpended balance of 1918 War Department appropriation of \$20,000 made available under Interior Department during 1919. Sundry civil act of July 1, 1918 (40 Stat., 678).¹² For purchase of private holdings.¹³ Appropriations without year, for examination of water supply for city of San Francisco.

Statement of appropriations made for, and revenues received from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
General Grant—Continued.				
1919.....	\$4,500.00	\$4,481.81	\$1,063.90	(10)
1920.....	6,000.00	5,992.89	1,870.83	(10)
1921.....	5,300.00			
Mount Rainier:				
1907.....	12,500.00	2,407.91	205.22	
1908.....	3,000.00	2,965.59	170.00	88.96
1909.....	3,000.00	2,961.61	1,104.79	27.65
1910.....	3,000.00	3,000.00	9,063.79	2,762.86
1911.....	3,000.00	2,998.90	7,748.48	5,342.47
1912.....	5,400.00	5,399.99	5,370.36	9,362.33
1913.....	20,000.00	19,989.70	7,301.62	6,791.80
1914.....	23,400.00	23,347.05	9,040.10	6,039.42
1915.....	51,000.00	50,907.79	12,898.29	5,512.46
1916.....	30,000.00	30,000.00	19,317.99	15,026.06
1917.....	30,000.00	29,999.19	14,348.80	17,617.04
1918.....	75,000.00	74,846.67	17,241.25	34,715.96
1919.....	24,600.00	24,552.28	17,336.47	(10)
1920.....	32,500.00	32,409.56	22,153.76	(10)
1921.....	40,000.00			
Crater Lake:				
1904.....	2,000.00	(1)		
1905.....	3,000.00	(1)		
1906.....	3,000.00	(1)		
1907.....	3,000.00	2,989.75	10.00	(10)
1908.....	7,315.00	7,314.65		
1909.....	3,000.00	2,999.21	15.00	
1910.....	3,000.00	2,999.97	11.00	
1911.....	3,000.00	2,999.77	30.00	
1912.....	3,000.00	2,998.75	323.00	
1913.....	3,000.00	2,978.41	784.18	
1914.....	7,540.00	7,483.61	793.00	
1915.....	8,040.00	7,884.59	1,359.50	
1916.....	8,000.00	7,986.84	2,402.04	
1917.....	8,000.00	7,999.88	4,565.25	
1918.....	15,000.00	14,738.44	5,506.72	
1919.....	13,225.00	13,204.82	5,958.21	(10)
1920.....	28,225.00	28,170.53	8,327.73	(10)
1921.....	25,300.00			
Platt:				
1906.....	(10)		37,307.44	
1907.....			178.00	7,062.25
1908.....			7,021.00	10,552.26
1909.....			272.00	15,764.27
1910.....			164.50	11,734.74
1911.....	5,000.00	4,994.64	422.75	779.06
1912.....	10,000.00	9,999.34	165.50	219.84
1913.....	8,000.00	7,999.95	49.96	100.11
1914.....	17,500.00	17,120.73	17,500.00	10,119.00
1915.....	8,000.00	7,988.55	282.81	67.45
1916.....	8,000.00	8,000.00	241.76	178.87
1916 (deficiency, \$10,000).....	18,000.00	16,974.49	301.11	44.35
1917.....	8,000.00	8,000.00	434.11	128.28
1918.....	7,180.00	7,179.84	1,010.40	1,999.88
1919.....	7,500.00	7,485.65	422.63	(10)
1920.....	6,000.00	5,980.04	498.59	(10)
1921.....	9,000.00			
Wind Cave:				
1904.....	12,500.00	(1)		
1905.....	2,500.00	(1)		
1906.....	2,500.00	(1)		
1907.....	4,400.00	4,398.08		
1908.....	2,500.00	2,433.54	200.00	
1909.....	2,500.00	2,335.37	480.00	220.80
1910.....	2,500.00	2,500.00	523.25	62.88
1911.....	2,500.00	2,413.60	340.00	562.26

¹ Figures not available.

¹⁰ Expenditure of revenues for park purposes not authorized. Sundry civil act of June 12, 1917 (40 Stat., 153).

¹¹ No appropriation made for Mount Rainier prior to 1907.

¹² Expenditure of revenues of Crater Lake Park for park purposes not authorized by statute.

¹³ No appropriation for Platt Park prior to 1911 fiscal year. Land prior to creation of park included in Sulphur Springs Reservation.

¹⁴ Construction sanitary sewer, like amount being contributed by the city of Sulphur, Okla.: \$7,390 returned to city.

¹⁵ No appropriation made for the Wind Cave National Park prior to 1904.

Statement of appropriations made for, and revenues received from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Wind Cave—Continued.				
1912.....	\$2,500.00	\$2,499.86	\$675.00	\$278.56
1913.....			528.26	1,197.39
1914.....	2,500.00	2,500.00	246.17	366.72
1915.....	2,500.00	2,496.97	2,342.90	606.16
1916.....	2,500.00	2,497.82	2,590.89	981.57
1917.....	2,500.00	2,499.87	1,632.60	1,013.04
1918.....	2,500.00	2,500.00	4,082.60	8,006.53
1919.....	4,000.00	3,988.52	2,533.15	(16)
1920.....	4,000.00	3,986.48	3,714.15	(16)
1921.....	5,000.00			
Sullys Hill:				
1914.....	500.00			
Mesa Verde:				
1907-8.....	19 7,500.00	7,455.82		(20)
1909.....	7,500.00	7,348.33		
1910.....	7,500.00	7,443.09		
1910-11 (for examination of coal lands in park).....	2,000.00	947.75		
1911.....	20,000.00	19,808.63	100.00	
1912.....	7,500.00	7,351.54	898.92	
1913.....	15,000.00	14,956.91	615.21	
1914.....	10,000.00	9,880.30	679.00	
1915.....	10,000.00	9,665.75	637.42	
1916.....	10,000.00	9,994.39	946.38	
1917.....	10,000.00	9,999.00	130.14	
1918.....	10,000.00	9,913.05	2,763.75	
1919.....	18,000.00	17,022.44	3,348.66	
1920.....	11,000.00	10,959.69	3,317.95	
1921.....	14,000.00			
Glacier:				
1911.....	21 15,000.00	14,998.59	326.88	
1912.....	69,200.00	69,117.94	1,490.94	
1913.....	75,000.00	74,568.24	4,677.14	428.84
1914.....	100,000.00	99,999.49	4,010.71	477.07
1915.....	75,000.00	74,994.27	4,218.51	9,735.44
1916.....	75,000.00	74,963.88	10,011.76	844.58
1917.....	110,000.00	108,148.16	3,202.40	1,352.75
1918.....	115,000.00	114,362.82	4,438.22	19,026.86
1919.....	80,000.00	79,950.18	2,624.53	(16)
1920.....	85,000.00	85,000.00	7,253.85	(16)
1920 (deficiency).....	81,849.12	81,849.12		
1921.....	95,000.00			
Rocky Mountain:				
1915 (deficiency).....	22 3,000.00	2,910.80		(21)
1916.....	8,000.00	7,992.84	501.93	
1917.....	10,000.00	9,964.24	871.27	
1918.....	10,000.00	9,922.10	598.75	
1919.....	10,000.00	9,994.36	307.50	(16)
1920.....	10,000.00	9,914.74	1,507.78	(16)
1921.....	40,000.00			
Hawaii:				
1919.....	750.00	730.50		
1920.....	750.00	747.52		
1921.....	1,000.00			
Lassen Volcanic:				
1917.....			81.25	(16)
1918.....			118.05	(16)
1921.....	2,500.00			
Grand Canyon:				
1919.....			525.03	(16)
1920.....	40,000.00	40,000.00	399.32	(16)
1921.....	60,000.00			
Lafayette:				
1919.....	24 10,000.00	9,972.42		
1920.....	10,000.00	9,919.74		
1921.....	20,000.00			

¹ Figures not available.

¹⁹ Expenditure of revenue for park purposes not authorized. Sundry civil act of June 12, 1917 (40 Stat., 153).

²⁰ No appropriation made for the Mesa Verde National Park prior to 1907.

²¹ Expenditure of revenues Mesa Verde Park for park purposes not authorized by statute.

²² No appropriation made for Glacier National Park prior to 1911.

²³ No appropriation made for the Rocky Mountain National Park prior to 1915.

²⁴ Expenditure of revenues from Rocky Mountain Park for park purposes not authorized by statute.

²⁵ Appropriation for 1919 made under the name of Sieur de Monts National Monument.

Statement of appropriations made for, and revenues received from, the various national parks and national monuments, etc.—Continued.

Name of the national park.	Appropriations.		Revenues.	
	Appropriated.	Expended.	Received.	Expended.
Zion:				
1917 (deficiency).....	\$15,000.00	\$14,963.81		
1920.....			\$511.50	(1*)
1921.....	7,300.00			
Protection of national monument:				
1917.....	3,500.00	2,586.66		
1918.....	5,000.00	4,832.70	225.00	(2*)
1919.....	10,000.00	9,486.00	320.75	
1920.....	8,000.00	7,699.04	123.50	
1921.....	8,000.00			
1 Casa Grande National Monument: (3)				
1904.....	900.00			
1905.....	900.00			
1906.....	900.00			
1907.....	900.00			
1908.....	900.00			
1909.....	900.00			
1910.....	900.00			
1911.....	900.00			
1912.....	900.00			
1913.....	900.00			
1914.....	900.00			
1915.....	900.00			
1916.....	900.00			
1917.....	900.00			
1918.....	900.00			
1919.....	900.00			
Under the Smithsonian Institution:				
1907.....	3,000.00			
1908.....	3,000.00			
Improvement of Navajo National Monument, Ariz.: 1917.....	3,000.00	1,962.69		
National Park Service:				
1917.....	3,666.67	2,513.62		
1918.....	17,600.00	17,413.33		
1919.....	19,200.00	19,177.50		
1920.....	22,220.00	21,524.46		
1921.....	27,420.00			

¹⁰ Expenditure of revenues for park purposes not authorized. Sundry civil act of June 12, 1917 (40 Stat., 153).

²⁰ Expended under the direction of the Commissioner of the General Land Office, excepting \$6,000 as noted under the Smithsonian Institution.

³⁰ Expended under direction of Smithsonian Institution.

³⁷ Expenditure of revenue for monument purposes not authorized.

Summary of appropriations for the administration, protection, and improvement of the national parks and national monuments, together with the revenues received, for the fiscal years 1904 to 1921, inclusive.

Year.	Department.	Appropriation.	Revenues.
1904	Interior Department.....	\$68,538.64	
	War Department.....	280,000.00	
		\$348,538.64	\$18,430.00
1905	Interior Department.....	42,400.00	
	War Department.....	250,000.00	
		292,400.00	19,330.00
1906	Interior Department.....	57,300.00	
	War Department.....	183,000.00	
		240,300.00	59,578.27
1907	Interior Department.....	39,050.00	
	War Department.....	105,000.00	
		144,050.00	31,749.72
1908	Interior Department.....	79,765.00	
	War Department.....	125,000.00	
		204,765.00	54,877.61
1909	Interior Department.....	74,950.00	
	War Department.....	90,000.00	
		164,950.00	57,004.73
1910	Interior Department.....	72,450.00	
	War Department.....	100,000.00	
		172,450.00	72,947.55
1911	Interior Department.....	154,385.00	
	War Department.....	75,000.00	
		229,385.00	187,198.01
1912	Interior Department.....	174,550.00	
	War Department.....	95,000.00	
		269,550.00	85,010.73
1913	Interior Department.....	245,450.00	
	War Department.....	227,000.00	
		472,450.00	115,443.72
1914	Interior Department.....	303,890.00	
	War Department.....	275,000.00	
		578,890.00	96,801.00
1915	Interior Department.....	284,490.00	
	War Department.....	340,000.00	
		624,490.00	119,433.56
1916	Interior Department.....	253,646.80	
	War Department.....	245,000.00	
		498,646.80	177,470.09
1917	Interior Department.....	537,366.67	
	War Department.....	247,200.00	
		784,566.67	190,652.30
1918	Interior Department.....	530,690.00	
	War Department.....	70,000.00	
		600,690.00	121,330.55
1919	.....	986,364.48	196,678.03
1920	.....	907,070.76	316,877.96
1921	.....	973,820.00	.....

¹ The revenues from the various national parks were expendable during the years 1904 to 1918, inclusive, with the exception of those received from Crater Lake, Mesa Verde, and Rocky Mountain National Parks, the revenues from which were turned into the Treasury to the credit of miscellaneous receipts.

APPENDIX D.

LEGISLATION.

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LEGISLATION.

An act to establish the Zion National Park in the State of Utah.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Zion National Monument, in the county of Washington, State of Utah, established and designated as a national monument under the Act of June 8, 1906, entitled "An Act for the preservation of American antiquities," by presidential proclamations of July 31, 1909, and March 18, 1918, is hereby declared to be a national park and dedicated as such for the benefit and enjoyment of the people, under the name of the Zion National Park, under which name the aforesaid national park shall be maintained by allotment of funds heretofore or hereafter appropriated for the national monuments, until such time as an independent appropriation is made therefor by Congress.

SEC. 2. That the administration, protection, and promotion of said Zion National Park shall be exercised under the direction of the Secretary of the Interior by the National Park Service, subject to the provision of the Act of August 25, 1916, entitled "An Act to establish a National Park Service, and for other purposes," and Acts additional thereto or amendatory thereof.

Approved, November 19, 1919. (41 Stat., 356.)

An act to authorize the governor of the Territory of Hawaii to acquire privately owned lands and rights of way within the boundaries of the Hawaii National Park.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the governor of the Territory of Hawaii is hereby authorized to acquire, at the expense of the Territory of Hawaii, by exchange or otherwise, all privately owned lands lying within the boundaries of the Hawaii National Park as defined by "An Act to establish a national park in the Territory of Hawaii," approved August 1, 1916, and all necessary perpetual easements and rights of way, or roadways, in fee simple, over or to said land or any part thereof.

SEC. 2. That the provisions of section 73 of an Act entitled "An Act to provide a government for the Territory of Hawaii," approved April 30, 1900, as amended by an Act approved May 27, 1910, relating to exchanges of public lands, shall not apply in the acquisition, by exchange, of the privately owned lands herein referred to.

Approved, February 27, 1920. (41 Stat., 452.)

An act to accept the cession by the State of California of exclusive jurisdiction of the lands embraced within the Yosemite National Park, Sequoia National Park, and General Grant National Park, respectively, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the provisions of the act of the Legislature of the State of California (approved April 15, 1919) ceding to the United States exclusive jurisdiction over the territory embraced and included within the Yosemite National Park, Sequoia National Park, and General Grant National Park, respectively, are hereby accepted and sole and exclusive jurisdiction is hereby assumed by the United States over such territory, saving, however, to the said State of California the right to serve civil or criminal process within the limits of the aforesaid parks or either of them in suits or prosecutions for or on account of rights acquired, obligations incurred, or crimes committed in said State outside of said parks; and saving further to the said State the right to tax persons and corporations, their franchises and property on the lands included in said parks, and the right to fix and collect license fees for fishing in said parks; and saving also to the persons residing

in any of said parks now or hereafter the right to vote at all elections held within the county or counties in which said parks are situated. All the laws applicable to places under sole and exclusive jurisdiction of the United States shall have force and effect in said parks or either of them. All fugitives from justice taking refuge in said parks, or either of them, shall be subject to the same laws as refugees from justice found in the State of California.

SEC. 2. That said Yosemite National Park shall constitute a part of the United States judicial district for the northern district of California, and the district court of the United States in and for said northern district shall have jurisdiction of all offenses committed within said boundaries of the Yosemite National Park.

SEC. 3. That said Sequoia National Park and General Grant National Park shall constitute part of the United States judicial district for the southern district of California, and the district court of the United States in and for said southern district shall have jurisdiction of all offenses committed within the boundaries of said Sequoia National Park and General Grant National Park.

SEC. 4. That if any offense shall be committed in the Yosemite National Park, Sequoia National Park, General Grant National Park, or either of them, which offense is not prohibited or the punishment is not specifically provided for by any law of the United States, the offender shall be subject to the same punishment as the laws of the State of California in force at the time of the commission of the offense may provide for a like offense in said State; and no subsequent repeal of any such law of the State of California shall affect any prosecution for said offense committed within said parks, or either of them.

SEC. 5. That all hunting or the killing, wounding, or capturing at any time of any wild bird or animal, except dangerous animals, when it is necessary to prevent them from destroying human lives or inflicting personal injury, is prohibited within the limits of said parks; or shall any fish be taken out of any of the waters of the said parks, or either of them, in any other way than by hook and line, and then only at such seasons and such times and manner as may be directed by the Secretary of the Interior. That the Secretary of the Interior shall make and publish such general rules and regulations as he may deem necessary and proper for the management and care of the park and for the protection of the property therein, especially for the preservation from injury or spoliation of all timber, mineral deposits other than those legally located prior to the passage of the respective Acts creating and establishing said parks, natural curiosities or wonderful objects within said parks, and for the protection of the animals in the park from capture or destruction, and to prevent their being frightened or driven from the said parks; and he shall make rules and regulations governing the taking of fish from the streams or lakes in the said parks or either of them. Possession within said parks, or either of them, of the dead bodies or any part thereof of any wild bird or animal shall be prima facie evidence that person or persons having same are guilty of violating this Act. Any person or persons, or stage or express company, or railway company, who knows or has reason to believe that they were taken or killed contrary to the provisions of this Act, and who receives for transportation any of said animals, birds, or fish so killed, caught, or taken, or who shall violate any of the other provisions of this Act, or any rule or regulation that may be promulgated by the Secretary of the Interior, with reference to the management and care of the said parks, or either of them, or for the protection of the property therein for the preservation from injury or spoliation of timber, mineral deposits, other than those legally located prior to the passage of the respective Acts creating and establishing said parks, natural curiosities, or wonderful objects within said parks, or either of them, or for the protection of the animals, birds, or fish in the said parks, or either of them, or who shall within said parks commit any damage, injury, spoliation to or upon any building, fence, hedge, gate, guide post, tree, wood, underwood, timber, garden, crops, vegetables, plants, land, springs, mineral deposits other than those legally located prior to the passage of the respective Acts creating and establishing said parks, natural curiosities, or other matter or thing growing or being thereon, or situated therein, shall be subject to the penalty provided for the violation of rules and regulations of the Secretary of the Interior authorized by section 3 of the Act of Congress approved August 25, 1916 (Thirty-ninth Statutes, page 535), entitled 'An Act to establish a National Park Service, and for other purposes,' which section is hereby amended by striking therefrom the words "and any violations of any of the rules and regulations authorized by

this Act shall be punished as provided for in section 50 of the Act entitled 'An Act to codify and amend the Penal Laws of the United States,' approved March 4, 1909, as amended by section 6 of the Act of June 25, 1910 (Thirty-sixth United States Statutes at Large, page 857)," and inserting in lieu thereof the words "and any violation of any of the rules and regulations authorized by this Act shall be punished by a fine of not more than \$500 or imprisonment for not exceeding six months, or both, and be adjudged to pay all cost of the proceedings": *Provided*, That nothing herein shall be construed as repealing or in any way modifying the authority granted the Secretary of the Interior by said section 3 of the said Act approved August 25, 1916, to sell or dispose of timber in national parks in those cases where, in his judgment, the cutting of such timber is required in order to control the attacks of insects or diseases or otherwise conserve the scenery of the natural or historic objects in such parks and to provide for the destruction of such animals and such plant life as may be detrimental to the use of any of said parks, or the authority granted to said Secretary by the Act approved April 9, 1912, entitled "An Act to authorize the Secretary of the Interior to secure for the United States title to patented lands in the Yosemite National Park, and for other purposes," as amended by the Act approved April 16, 1914.

SEC. 6. That all guns, traps, teams, horses, or means of transportation of every nature or description used by any person or persons within the limits of said parks, or either of them, when engaged in killing, trapping, ensnaring, or capturing such wild beasts, birds, or animals, shall be forfeited to the United States and may be seized by the officers in said parks, or either of them, and held pending prosecution of any person or persons arrested under the charge of violating the provisions of this Act, and upon conviction such forfeiture shall be adjudicated as a penalty in addition to the other punishment prescribed in this Act. Such forfeited property shall be disposed of and accounted for by and under the authority of the Secretary of the Interior.

SEC. 7. That the United States District Court for the Northern District of California shall appoint a commissioner for the Yosemite National Park, who shall reside in said park, and who shall have jurisdiction to hear and act upon all complaints made of any violations of law, or of the rules and regulations made by the Secretary of the Interior, for the government of said Yosemite National Park, and for the protection of the animals, birds, and fish, and objects of interest therein, and for other purposes authorized by this Act.

Such commissioner shall have power, upon sworn information, to issue process in the name of the United States for the arrest of any person charged with the commission of any misdemeanor, or charged with a violation of the rules and regulations, or with a violation of any of the provisions of this Act prescribed for the government of said Yosemite National Park, and for the protection of the animals, birds, and fish in said park, and try persons so charged, and if found guilty impose punishment and to adjudge forfeiture prescribed.

In all cases of conviction an appeal shall lie from the judgment of said commissioner to the United States Court for the Northern District of California, and the United States district court in said district shall prescribe rules and procedure and practice for said commissioner in the trial of cases and for appeals to said United States district court.

SEC. 8. That the United States District Court for the Southern District of California shall appoint a commissioner for the Sequoia National Park and the General Grant National Park, who shall reside in one of said parks, and who shall have jurisdiction to hear and act upon all complaints made of any violations of the law or of the rules and regulations made by the Secretary of the Interior, for the government of the Sequoia National Park and the General Grant National Park, and for the protection of the animals, birds, and fish, and objects of interest therein, and for other purposes authorized by this Act.

Such commissioner shall have power, upon sworn information, to issue process in the name of the United States for the arrest of any person charged with the commission of any misdemeanor, or charged with a violation of the rules and regulations, or with a violation of any of the provisions of this Act prescribed for the government of said Sequoia National Park and General Grant National Park, or either of them, and for the protection of the animals, birds, and fish in said last-named parks, or either of them, and try persons so charged, and, if found guilty, impose punishment and to adjudge forfeiture prescribed.

In all cases of conviction an appeal shall lie from the judgment of said commissioner to the United States Court for the Southern District of California, and the United States district court in said district shall prescribe rules and procedure and practice for said commissioner in the trial of cases and for appeals to said United States district court.

Sec. 9. That any such commissioner within his jurisdiction shall also have the power to issue process as hereinbefore provided for the arrest of any person charged with commission within said boundaries of said parks, or either of them, as specified above in this Act, of any criminal offense not covered by the provisions of section 5 of this Act, to hear the evidence introduced, and if he is of the opinion that probable cause is shown for holding the person so charged for trial, he shall cause such person to be safely conveyed to a secure place of confinement within the jurisdiction of the United States district court in and for the judicial district to which he belongs, and certify a transcript of the record of his proceedings and testimony in the case to the court, to which the park is attached as above specified in this Act, which court shall have jurisdiction of the case: *Provided*, That the said commissioner shall grant bail in all cases bailable under the laws of the United States or of said State.

Sec. 10. That all process issued by the commissioner of the Yosemite National Park shall be directed to the marshal of the United States for the northern district of California, and all process issued by the commissioner of the Sequoia National Park and the General Grant National Park shall be directed to the marshal of the United States for the southern district of California, but nothing herein contained shall be so construed to prevent the arrest by any officer or employee of the Government or any person employed by the United States, in the policing of such reservation within the boundaries of said parks, or either of them, without process of any person taken in the act of violating the law or this Act or the regulation prescribed by said Secretary as aforesaid.

Sec. 11. That the commissioner provided for in this Act for the Yosemite National Park and the commissioner provided for in this Act for the Sequoia National Park and the General Grant National Park each shall be paid an annual salary of \$1,500, payable monthly: *Provided*, That the said commissioner for the Yosemite National Park shall reside within the exterior boundaries of said Yosemite National Park, and the commissioner provided for the Sequoia National Park and the General Grant National Park shall reside within the exterior boundaries of one of the said last-named national parks and at a place to be designated by the court making such appointment: *And provided further*, That all fees, costs, and expenses collected by the commissioner shall be disposed of as provided in section 13 of this Act.

Sec. 12. That all fees, costs, and expenses arising in cases under this Act and properly chargeable to the United States shall be certified, approved, and paid as are like fees, costs, and expenses in the courts of the United States.

Sec. 13. That all fines and costs imposed and collected shall be deposited by said commissioners of the United States, or the marshal of the United States collecting the same, with the clerk of the United States district court to which said parks are attached, as provided in this Act.

Sec. 14. That the Secretary of the Interior shall notify in writing the governor of the State of California of the passage and approval of this Act and of the fact that the United States assumes police jurisdiction over said parks, as specified in said Act.

Approved, June 2, 1920. (41 Stat., 731.)

Excerpts from "An Act Making appropriations for sundry civil expenses of the Government for the fiscal year ending June 30, 1921, and for other purposes."

DEPARTMENT OF THE INTERIOR.

NATIONAL PARKS.

National Park Service: Director, \$4,500; assistant director, \$2,500; chief clerk, \$2,000; editor, \$2,000; draftsman, \$1,800; accountant, \$1,800; clerks—two of class four, two of class three, one of class two, one of class one, one \$1,020, two at \$900 each; messenger, \$600; in all, for park service in the District of Columbia, \$27,420.

Hereafter the Secretary of the Interior in his administration of the National Park Service is authorized, in his discretion, to accept patented lands, rights of

way over patented lands or other lands, buildings, or other property within the various national parks and national monuments, and moneys which may be donated for the purposes of the national park and monument system.

Crater Lake National Park, Oregon: For administration, protection, maintenance, and improvement, including not exceeding \$600 for the maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for the use of the superintendent and employees in connection with general park work, \$25,300.

General Grant National Park, California: For administration, protection, maintenance, and improvement, \$5,300.

Glacier National Park, Montana: For administration, protection, maintenance, and improvement, including necessary repairs to the roads from Glacier Park Station through the Blackfeet Indian Reservation to various points in the boundary line of the Glacier National Park and to the International Boundary, including not exceeding \$1,000 for the maintenance, repair, and operation of one motor-driven passenger-carrying vehicle and horse-drawn passenger-carrying vehicles for the use of the superintendent and employees in connection with general park work, \$95,000.

Grand Canyon National Park, Arizona: For administration, protection, maintenance, improvement, and the acquisition of lands for road and trail rights of way within the park, including not exceeding \$1,000 for the maintenance, operation, and repair of motor-driven passenger-carrying vehicles for the use of the superintendent and employees in connection with general park work, \$60,000: *Provided*, That no expenditure shall be made in the maintenance or improvement of any toll road or toll trail.

Hawaii National Park: For expenses incident to securing donations of patented lands and rights of way over patented lands in Hawaii National Park, \$1,000.

Hot Springs Reservation, Arkansas: The unexpended balance on June 30, 1920, of the appropriation and authorization contained in the Sundry Civil Appropriation Act for the fiscal year 1919 for the construction of a new administration and Government free bathhouse building is reappropriated and made available for the fiscal year 1921. The Secretary of the Interior is authorized, in his discretion, to use such appropriation and authorization in the construction of separate buildings for administration and free bathhouse purposes and to accept sites in the city of Hot Springs which may be donated for said buildings.

The Secretary of the Interior is hereby authorized to assess and collect from physicians, who desire to prescribe the hot waters from the Hot Springs Reservation, reasonable charges for the exercise of such privilege, including fees for examination and registration; and he is also authorized to assess and collect from bath attendants and masseurs operating in all bathhouses receiving hot water from the reservation, reasonable charges for the exercise of such privileges. The moneys received from the exercise of this authority shall be used in the protection and improvement of the said reservation.

Lafayette National Park, Maine: For administration, maintenance, protection, and improvement, including not exceeding \$600 for maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for use in administration of the park, \$20,000.

Lassen Volcanic National Park, California: For protection and improvement, \$2,500.

Mesa Verde National Park, Colorado: For administration, protection, maintenance, and improvement, including not exceeding \$800 for maintenance, operation, and repair of horse-drawn and motor-driven passenger-carrying vehicles for use of the superintendent and employees, \$14,000.

Mount Rainier National Park, Washington: For administration, protection, maintenance, and improvement, including not exceeding \$800 for the maintenance, operation, and repair of a motor-driven passenger-carrying vehicle for use of the superintendent and park employees in connection with general park work, \$40,000, of which sum \$1,500 shall be immediately available for the installation and repair of telephone lines.

National Monuments: For the administration, protection, maintenance, preservation, and improvement of the national monuments, to be expended under the direction of the Secretary of the Interior, \$8,000.

Platt National Park, Oklahoma: For administration, protection, maintenance, improvement and extension of sewer system, including the purchase of a wagon and team of mules for the use of the superintendent and employees in connection with general park work and the purchase of provender therefor, \$9,000.

Rocky Mountain National Park, Colorado: For administration, protection, maintenance, and improvement, including not exceeding \$1,500 for the purchase, maintenance, operation and repair of a motor-driven passenger-carrying vehicle for use of the superintendent and employees in connection with general park work, \$40,000.

Sequoia National Park, California: For administration, protection, maintenance and improvement, including not exceeding \$800 for the maintenance, operation, and repair of a motor-driven, passenger-carrying vehicle for the use of the superintendent and employees in connection with general park work, and not exceeding \$3,000 for the construction of a building for administration purposes at Giant Forest, \$36,000.

Wind Cave National Park, South Dakota: For administration, protection, maintenance, and improvement, \$5,000.

Yellowstone National Park, Wyoming: For administration, protection, maintenance, and improvement, including not to exceed \$8,400 for maintenance of the road in the forest reserve leading out of the park from the east boundary, not to exceed \$7,500 for maintenance of the road in the forest reserve leading out of the park from the south boundary, not to exceed \$7,600 for the purchase, operation, maintenance, and repair of motor-propelled passenger-carrying vehicles, and including feed for buffalo and other animals and salaries of buffalo keepers, \$278,000, to be expended by and under the direction of the Secretary of the Interior: *Provided*, That not exceeding \$2,000 may be expended for the removal of snow from any of the roads for the purpose of opening them in advance of the tourist season.

Yosemite National Park, California: For administration, protection, maintenance, and improvement, including not exceeding \$1,800 for purchase, maintenance, operation, and repair of horse-drawn and motor-driven passenger-carrying vehicles for use of the superintendent and employees in connection with general park work, \$300,000.

Zion National Park, Utah: For administration, protection, maintenance, and improvement, \$7,800.

Approved, June 5, 1920. (41 Stat., 917, 918, 919.)

Excerpts from "An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1920, and prior fiscal years, and for other purposes."

DEPARTMENT OF THE INTERIOR.

NATIONAL PARK SERVICE.

Glacier National Park, Montana: For reimbursement of the appropriation for Glacier National Park for the fiscal year 1920 on account of expenditures for fighting forest fires in the park, \$50,000.

For the construction of a bridge over the Flathead River at Belton, Montana, \$12,000.

Yellowstone National Park, Wyoming: For reimbursement of the appropriation for Yellowstone National Park for the fiscal year 1920 on account of expenditures for fighting forest fires in the park, \$25,000.

Approved, November 4, 1919. (41 Stat., 335.)

Excerpts from "An Act Making appropriations to supply deficiencies in appropriations for the fiscal year ending June 30, 1920, and prior fiscal years, and for other purposes."

DEPARTMENT OF THE INTERIOR.

NATIONAL PARK SERVICE.

Glacier National Park, Montana: For reimbursement of the appropriation for the park for the fiscal year 1920 on account of expenditures for fighting forest fires in the park, \$19,849.12.

Yellowstone National Park, Wyoming: For reimbursement of the appropriation for the park for the fiscal year 1920 on account of expenditures for fighting forest fires in the park and purchasing hay for feeding of elk, \$35,026.64.

For the purchase of such additional quantities of hay as may be necessary to insure preservation of the northern herd of elk, \$8,000.

For the construction of a log crib dam necessary for the protection of bridge over the Elk Fork of the Shoshone River on the Cody approach road to Yellowstone National Park, \$3,000.

Approved, March 6, 1920. (41 Stat., 512.)

RESOLUTIONS.

[House resolution 159, report No. 871, Sixty-sixth Congress, second session.]

Resolved, That the Secretary of the Interior be, and is hereby, directed to investigate and report to the House of Representatives as to the suitability, location, cost, if any, and advisability of securing a tract or tracts of land in the State of California containing a stand of typical redwood trees of the species "*Sequoia Sempervirens*" with a view that such land be set apart and dedicated as a national park for the benefit and enjoyment of the people of the United States and for the purpose of preserving such trees from destruction and extinction, and also as to whether or not the whole or any part of such lands or the purchase price thereof would be donated to the United States, and the probable cost of maintaining such lands as a part of the national park system.

PRESIDENTIAL PROCLAMATIONS.

[By the President of the United States of America: A proclamation.]

GRAN QUIVIRA NATIONAL MONUMENT, NEW MEXICO (SECOND PROCLAMATION).

Whereas it appears that the public good will be promoted by adding to the Gran Quivira National Monument certain lands in the State of New Mexico containing ruins of archaeological value;

Now, therefore, I, Woodrow Wilson, President of the United States of America, by virtue of the power vested in me by section two of the act of Congress approved June 8, 1906, entitled "An act for the preservation of American antiquities" (34 Stat., 225), do proclaim that said lands, to wit, the tracts described as the S. $\frac{1}{2}$ SW. $\frac{1}{4}$, and S. $\frac{1}{2}$ SE. $\frac{1}{4}$, sec. 34, the S. $\frac{1}{2}$ SW. $\frac{1}{4}$, sec. 35, T. 1 N., R. 8 E., and unsurveyed lands which by protraction of the lines of the public survey in T. 1 S., R. 8 E., would probably be described as the N. $\frac{1}{2}$ NW. $\frac{1}{4}$ sec. 2 and the N. $\frac{1}{2}$ NE. $\frac{1}{4}$ sec. 4, in T. 1 S., R. 8 E., New Mexico principal meridian, are hereby reserved from appropriation and use of all kinds under the public land laws, subject to all prior valid claims, and set apart as an addition to the Gran Quivira National Monument, and that the boundaries of said national monument are now as shown on the diagram hereto annexed and forming a part hereof.

Warning is hereby given to all unauthorized persons not to appropriate or injure any natural feature of this monument or to occupy, exploit, settle, or locate upon any of the lands reserved by this proclamation.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument, as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat., 535).

In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the District of Columbia this 25th day of November, in the year of our Lord one thousand nine hundred and nineteen, and of the independence of the United States of America the one hundred and forty-fourth.

[SEAL.]

WOODROW WILSON.

By the President:

ROBERT LANSING, *Secretary of State*.

[No. 1545.]

[By the President of the United States of America: A proclamation.]

SCOTTS BLUFF NATIONAL MONUMENT, NEBRASKA.

Whereas Scotts Bluff is the highest known point within the State of Nebraska, affording a view for miles over the surrounding country;

Whereas Mitchell Pass, lying to the south of said bluff, was traversed by the old Oregon Trail and said bluff was used as a landmark and rendezvous by thousands of immigrants and frontiersmen traveling said trail en route for new homes in the Northwest; and

Whereas, in view of these facts as well as of the scientific interest the region possesses from a geological standpoint, it appears that the public interests will be promoted by reserving the lands upon which the said bluff and the said pass are located as a national monument:

Now, therefore, I, Woodrow Wilson, President of the United States of America, by virtue of the power and authority in me vested by section two of the act of Congress entitled "An act for the preservation of American antiquities," approved June 8, 1906 (34 Stat., 225), do proclaim that there are hereby reserved from all forms of appropriation under the public-land laws and set apart as the Scotts Bluff National Monument the following described lands, to wit: The northwest quarter, north half of the southwest quarter, southeast quarter of the southwest quarter, southwest quarter of the northeast quarter, and the west half of the southeast quarter of section four, township twenty-one north, range fifty-five west; lots one, two, and three, south half of the northeast quarter, north half of the southeast quarter, southeast quarter of the northwest quarter, and the northeast quarter of the southwest quarter of section five, township twenty-one north, range fifty-five west; the northeast quarter of section nine, township twenty-one north, range fifty-five west; lots six and seven, section twenty-seven, township twenty-two north, range fifty-five west; lot four, southeast quarter, and south half of the southwest quarter of section twenty-eight, said township and range; the southeast quarter of the southeast quarter of section twenty-nine, said township and range; the east half of the east half of section thirty-two, said township and range; and the north half southwest quarter, north half of the southeast quarter, and the southwest quarter of the southeast quarter of section thirty-three, township twenty-two north, range fifty-five, all west of the sixth principal meridian in the State of Nebraska, and that the boundaries of the said Scotts Bluff National Monument are as shown on the diagram hereto attached and made a part hereof.

Warning is hereby given to all unauthorized persons not to appropriate or injure any natural feature of this monument or to occupy, exploit, settle, or locate upon any of the lands reserved by this proclamation.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument, as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat., 535).

In witness whereof I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the District of Columbia this 12th day of December, in the year of our Lord one thousand nine hundred and nineteen, and of the Independence of the United States of America the one hundred and forty-fourth.

[SEAL.]

WOODROW WILSON.

By the President:

ROBERT LANSING, *Secretary of State*.

[No. 1547.]

[By the President of the United States of America: A proclamation.]

YUCCA HOUSE NATIONAL MONUMENT (COLORADO).

Whereas there is in Montezuma County, Colorado, on the eastern slope of the Sleeping Ute Mountain an imposing pile of masonry of great archaeological value, relic of the prehistoric inhabitants of that part of the country; and

Whereas the ground on which said structure stands has been donated to the United States for the establishment of a national monument with a view to the

preservation of said ruins, and such preservation is deemed to be in the public interest;

Now, therefore, I, Woodrow Wilson, President of the United States of America, by virtue of the power and authority in me vested by section two of the act of Congress entitled "An act for the preservation of American antiquities," approved June 8, 1906 (34 Stat., 225), do proclaim that there is hereby reserved and set apart as a national monument, to be known as the Yucca House National Monument, all that piece or parcel of land in the county of Montezuma, State of Colorado, shown upon the diagram hereto annexed and made a part hereof, and more particularly described as follows: Beginning at a point that bears south 46° 45' east from the north quarter corner of section 35, township 35 north, range 17 west, New Mexico principal meridian, 1,513 feet; thence south 600 feet; thence east 600 feet; thence north 300 feet; thence east 230 feet; thence north 100 feet; thence north 28° 53' west 228.4 feet; thence west 719.7 feet to place of beginning, containing 10 acres, more or less.

Warning is hereby expressly given to all unauthorized persons not to appropriate, injure, destroy, or remove any of the features or objects included within the boundaries of this monument and not to locate or settle upon any of the lands thereof.

The Director of the National Park Service, under the direction of the Secretary of the Interior, shall have the supervision, management, and control of this monument, as provided in the act of Congress entitled "An act to establish a National Park Service, and for other purposes," approved August 25, 1916 (39 Stat., 535).

In witness whereof, I have hereunto set my hand and caused the seal of the United States to be affixed.

Done in the District of Columbia this 19th day of December in the year of our Lord one thousand nine hundred and nineteen, and of the Independence of the United States of America the one hundred and forty-fourth.

[SEAL.]

By the President:

ROBERT LANSING, *Secretary of State.*

WOODROW WILSON.

[No. 1549.]

EXECUTIVE ORDERS.

[Executive order.]

Under the provisions of the act approved June 25, 1910 (36 Stat., 847), authorizing the President of the United States to make withdrawals of public lands in certain cases, it is hereby ordered that the public lands specifically described as the southwest quarter of the northeast quarter, the southeast quarter, the east half and the southwest quarter of the southwest quarter, section thirty-five, township seven south, range three east of the Black Hills Meridian, South Dakota, be and the same are hereby temporarily withdrawn from settlement, location, sale, or entry. The purpose of this withdrawal is to permit such examination of the lands as may be necessary to determine their availability for a permanent reservation under the provisions of the national monument act, approved June 8, 1906 (34 Stat., 225), to protect, in the public interest, the rich mesozoic deposits of cycads and other characteristic examples of paleobotany numerous found there.

WOODROW WILSON.

THE WHITE HOUSE, 30 June, 1920.

[No. 3297.]

[Executive order.]

SOUTH DAKOTA.

Under authority of the act of Congress approved June 25, 1910 (36 Stat., 847), as amended by the act of August 24, 1912 (37 Stat., 497), it is hereby ordered that the following-described lands in South Dakota be and the same are hereby temporarily withdrawn subject to the conditions, provisions, and limitations of

said acts, in order to protect the water supply of the Wind Cave National Park and the national bison range therein: *

In T. 5 S., R. 6 E., B. H. M., SW. $\frac{1}{4}$ sec. 20, NE. $\frac{1}{4}$ SW. $\frac{1}{4}$, N. $\frac{1}{4}$ SE. $\frac{1}{4}$ and SE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 30, and NW. $\frac{1}{4}$ sec. 32.

WOODROW WILSON.

THE WHITE HOUSE, 14 July, 1920.

[No. 3308.]

[Executive order.]

ARIZONA.

Under authority of the act of Congress approved June 25, 1910 (36 Stat., 847), as amended by the act of August 24, 1912 (37 Stat., 497), it is hereby ordered that the NE. $\frac{1}{4}$ of SE. $\frac{1}{4}$ of SW. $\frac{1}{4}$, sec. 30, T. 21 S., R. 13 E., G. and S. R. M., Arizona, containing 10 acres, be temporarily withdrawn subject to the conditions, provisions, and limitations of said acts for classification and pending determination as to the advisability of including such lands within the Tumacacori National Monument.

WOODROW WILSON.

THE WHITE HOUSE, 26 July, 1920.

[No. 3314.]

REPORTS ON LEGISLATION.

[Senate Report No. 452, Sixty-sixth Congress, second session.]

ROOSEVELT NATIONAL PARK.

February 25, 1920.—Ordered to be printed.

Mr. Phelan, from the Committee on Public Lands, submitted the following report (to accompany S. 1391):

The Committee on Public Lands, to whom was referred the bill (S. 1391) to add certain lands to the Sequoia National Park, Calif., and to change the name of said park to Roosevelt National Park, having considered the same, report favorably thereon with the recommendation that the bill do pass without amendment.

THE AREA INCLUDED IN THE PARK.

The land which this bill proposes to add to the Sequoi National Park (265 square miles at present) lies north and east of the park and is easily accessible by trail from the Giant Forest. It comprises a large area of mountain-top country approximating 1,335 square miles, making a total area of 1,600 square miles. Its eastern boundary of about 70 miles is the very crest of the Sierra Nevada Mountains, including Mount Whitney, whose elevation of 14,501 feet is the loftiest in the United States. Along this magnificent crest lies a massing of mountain peaks of indescribable grandeur, for Mount Whitney is no towering elevation, but merely a granite climax; its peak is a little higher than its neighbors, that is all.

Eastward from this crest descend superbly tumbled slopes rich in the grandest scenery of America and the world, merging, below the timber line, into innumerable lake-studded valleys which converge into the extraordinary valleys of the Kings and the Kerns Rivers. Two branches of the Kings River flow through valleys destined, when known, to be a celebrity second only to Yosemite Valley; one of these is the Tehiplite Valley, the other the Kings River Canyon. These lie north of the Sequoia National Park, while on its east lies still another valley of future world celebrity, the Kern Canyon.

This area which, united with the present Sequoia National Park, would make a "Greater Sequoia" of 1,600 square miles, constitutes a total of supreme scenic magnificence. It would make a national park unexcelled even in

America for sublimity and unequaled anywhere for rich variety. It is penetrated by trails and affords, with its three foaming rivers, its thousands of streams, its hundreds of lakes, its splendid forests, occasional meadows, castellated valleys, inspiring passes, and lofty glacier-shouldered summits, the future camping-out resort of many thousands yearly.

The Tehipte Valley and the Kings River Canyon, which are more accessible now than the Kern Canyon, have striking nobility of scenery. The walls of both are as sheer as and are often loftier than Yosemite's. The rivers which flow through them are glacier-run torrents of innumerable cascades and waterfalls, lined to the edge with forests and full of fighting trout.

Both valleys are guarded, like Yosemite, with gigantic rocks. The Tehipte Dome in the Tehipte Valley and the Grand Sentinel in the Kings River Canyon must be classed with Yosemite's greatest. The Tehipte Valley has grandeur for its keynote, as the Yosemite Valley has supreme beauty. The Kings River Canyon, with Paradise Valley a few miles upstream, is destined, at no great lapse of time, to become the summer resort of innumerable campers.

The public land proposed to be added to Sequoia National Park by these measures will never be valuable for any other than park purposes. Cattle are grazed on the mountain meadows during part of the year, but the administration of these meadows as part of the park will not interfere with the exercise of grazing privileges for many years to come. Small tracts of land here and there will be fenced for pasturage of live stock used by tourists.

In this connection some remarks submitted in the House by Hon. Frederick H. Gillett on January 14, 1919, have the value of personal testimony:

Mr. Chairman, I simply wish to indorse the statement which the gentleman from California has made. Three years ago I went through this Sequoia National Park and the King and Kern Valleys that he speaks of. We went in, out of the reach of the telegraph or the mail, with a pack train, and I spent there two of the most interesting and healthful weeks of my life. I do not suppose it is possible to compare different beauties of nature according to their relative excellence, but if there is any finer scenery in the world than this I should like to see it. But until I have seen it I shall be skeptical about it and be satisfied with the wonderful picturesqueness and variety of the valleys and gorges and mountains and chasms and streams of this extraordinary region. It did not seem to me it was useful for anything except a great camping-out place for the American people. Possibly a few sure-footed animals might get grazing there, but it was apparently created as a grand aggregation of scenic beauty where tired man could refresh and enjoy himself. As the gentleman from California [Mr. Elston] has said, it is very desirable that the present Sequoia Park should be enlarged so as to include this neighboring tract of wonderful scenery, and then nothing could be more appropriate than to name the whole after such a lover of nature as Theodore Roosevelt.

THE PROPOSED DESIGNATION—ROOSEVELT NATIONAL PARK.

The Secretary of the Interior, Hon. Franklin K. Lane, and the director of the National Park Service, Stephen T. Mather, urge not only the enlargement of the Sequoia National Park, but that it be named in honor of the late and well-beloved President and man, Theodore Roosevelt.

With respect to the proposed change in the name of the park the committee is unanimously in its favor. They believe it to be extremely fitting that this great park, which includes some of the most magnificent scenery in this country, should serve as a national monument to a great American.

In proposing the amendment on January 13, 1919, Senator Phelan spoke as follows:

Theodore Roosevelt was early identified with the West, and the west of the West. He sought among the great mountain ranges and the vast expanse of prairie a field for his abounding energy. From his narrow environment of city streets and congested population he naturally sought expansion. The liberalizing influences of the western life nationalized him and prepared him doubtless for the larger tasks which he was destined to assume. I can not imagine a more fitting memorial for a man of his character, courage, culture, generous nature, and love of the beautiful than the rugged, wild, and sublime scenery embraced in the region of central California. The story of William Tell might apply with equal pertinency to Theodore Roosevelt, who learned his love of liberty from his love of nature. He, too, was influenced by the mountain streams, which "plough the valleys without asking leave," and the mountain peaks, which "wear their caps of snow in the very presence of the regal sun." Here are the Kings and Kern River Canyons, Mount Whitney, the highest in the continental United States proper, and here in the crystal pure waters, "never too grave to smile, too tired to run," disport the golden trout, peculiar to this place alone, and already bearing the scientific description of *Salmo Rooseveltii*. There is no equal area on earth superior in natural wonders. It is bounded by the crests of the high Sierra, cataracts leap in glory from altitudinal clefts; giant trees lift their heads far above the besetting fog, erect amidst tempests, resplendent in the light of day, wreathed in immortelles, and serenely at home in the free air of Heaven. California—a State richly endowed by nature—can dedicate no finer monument to Roosevelt than this, the choicest of her natural gifts, nor the Nation a more appropriate memorial.

The legislation embodied in this bill has the approval of the Interior Department as set forth in the following letter, addressed to the chairman of the Committee on Public Lands of the Senate:

DEPARTMENT OF THE INTERIOR,
Washington, February 21, 1920.

MY DEAR SENATOR: You have requested a report on S. 1391, "A bill to add certain lands to the Sequoia National Park, Calif., and to change the name of said park to Roosevelt National Park."

This bill is identical in form and substance with S. 2021, Sixty-fifth Congress, as that measure was passed by the Senate on January 16, 1919. I indorsed that bill, not only in a formal departmental report, but also in a personal statement during the hearing before the Committee on the Public Lands of the House of Representatives after the measure had passed the Senate.

In this hearing I fully explained the plan of extending the present Sequoia National Park, and stated that it was my belief that no more fitting tribute to Theodore Roosevelt's noble influence upon American ideals or more enduring record of his inspiring personality could be devised than to associate his memory with a people's park, making forever accessible for succeeding generations the nature that he loved and sought and drew his strength from.

I am still of the opinion that this mountain group, the loftiest within the borders of the United States, formed of enduring granite and clothed below the timber line with giant trees, should be dedicated as the Roosevelt National Park to tell permanently what this distinguished man was and stood for, and of the people's affection for him.

In my report on the legislation of the Sixty-fifth Congress I made the following statement regarding the scenic character of the territory included in this park project, and the reasons why it should be given a park status:

"Sequoia National Park as now constituted was set apart in 1890 to preserve several magnificent groves of giant sequoia trees (*sequoia Washingtoniana*), the finest of which, the Giant Forest, is to-day the chief feature of interest to the visitor. The territory that would be added to this park by the enactment of the bill under consideration is approximately 1,800 square miles in extent and lies mostly east and north of the boundaries as now established.

"Scenically this country is unexcelled of its kind in the United States. Its eastern boundary follows the crest of the Sierra Nevada Mountains, from a point 55 miles below the Yosemite National Park's southern boundary southward to and including the climax of the Sierra, which is the mountain grouping in the neighborhood of our loftiest summit, Mount Whitney. In kind it is similar to Yosemite, but differs materially in variety, in climax, and particularly in the extraordinary massing of the peaks. Its small glaciers are many. Its granite cirques have unusual size and majesty. Lofty precipices abound. Interesting volcanic phenomena add to its picturesqueness and scientific significance. I know of no country of similar magnificence whose fastnesses can be penetrated and enjoyed with similar comfort, because of the practical absence of rain during the summer months. Few trail travelers carry tents.

"The slopes falling from this crest to the western boundaries of the proposed addition have equal distinction. This is an area of tumbled cross ranges holding between them canyons of exceptional wildness and charm. The number and variety of lakes is the traveler's constant surprise. The rivers formed by the confluence of innumerable cascading streams pass through gorges several of which are comparable in magnificence only to the Yosemite Valley. 'There are many Yosemite's,' writes Muir, and the several next in order of beauty are surely here. For sheer grandeur, Tehipte may even excel Yosemite. The rock walls of the Tehipte Valley and the Kings River Canyon frequently exceed Yosemite's in height. Those of Kern Canyon, Paradise Valley, and Fish Valley are only a little less. Tehipte Dome, the Grand Sentinel, and other outstanding rocks bear scenic comparison with Yosemite's greatest rock features and are likely to become as celebrated.

"I use the comparison only because of public familiarity with Yosemite. This country is no repetition. It is highly individual and different. But even if it were repetition, a sound reason for this additional reservation would still exist. The generation is not far ahead which will need two Yosemite's for its use and pleasure.

"Finally, there is a reason founded upon proportion and relationship. It seems to me that there is a peculiar fitness in adding to the distinction of Sequoia's forests of giant trees the further distinction of this colossal massing of mountains and of these extraordinary canyons. The common note is apparent. To unite them is to complete a whole, to create a national park in the superlative degree.

"All of this country is covered at the present time by forest reservations, a part of it being in the Sequoia National Forest and a part in the Sierra Forest. There is little opportunity for commercial development of this region. Much of it is far above timber line and practically no part of it lies below the 7,500-foot contour line. It is useless for farming purposes, although the mountain meadows are largely utilized for the pasturage of live stock during the summer months.

"The region is not accessible longer than four months of the year. The snowfall is heavy in winter. It closes the passes early in autumn and opens them by its disappearance late in the spring. Magnificent as it is in the summer months when this region can be visited and enjoyed by the lover of the mountains, it is a forbidding land at all other times."

There is some merchantable timber on the outskirts of the territory covered by this bill, but it should be preserved to protect the watersheds of the rivers and creeks and to complete the scenic features of the park. Part of this timber is of the giant sequoia species, two fine groves of these great trees standing only a short distance from areas now being cut over. It is unnecessary to remark that this timber should be safeguarded forever.

Under section 2 of the bill, water power and grazing permits may be granted where the development of power and the use of park lands for the pasturage of cattle "is not detrimental to the primary purpose for which the park was created." This section refers to the national park service act of August 25, 1916 (39 Stat., 535), which in section 4 specifically provides that nothing therein shall affect the act of February 15, 1901 (31 Stat., 790).

There is danger that private rights may be acquired in strategic portions of this territory owing to the fact that such rights are now obtainable within national forests. For any portion of the floor of the main Kings River Canyon, Tehiplite, and Paradise Valleys, and other Yosemite-like valleys, to be acquired by private interests to the exclusion of the public would be a serious national loss. At the present time, fortunately, there are comparatively few private holdings in the region.

Last year I sent to the committee a map showing the patented and unperfected entries, State lands, pending selections, and reconveyances, rights of way, and administrative site withdrawals. A list of these entries, selections, etc., with names of entrymen, as shown by the records of the General Land Office, was also transmitted for the committee's use. The total alienated area is 30,295.97 acres, of which 11,240 acres are bases of pending lieu selections under the act of June 4, 1897 (30 Stat., 36), and 2,010 acres are bases of pending State school indemnity selections.

The inclosed map indicates the boundaries of the present Sequoia Park and the boundaries it would have if enlarged as proposed by the pending measure.

I have no objections to offer to any of the provisions of the bill, and I heartily commend this legislation to the favorable consideration of your committee.

Cordially yours,

FRANKLIN K. LANE, *Secretary.*

Hon. REED SMOOT,

Chairman Committee on Public Lands, United States Senate.

[House Report No. 764, Sixty-sixth Congress, second session.]

ROOSEVELT NATIONAL PARK.

March 25, 1920.—Referred to the House Calendar and ordered to be printed.

Mr. Elston, from the Committee on the Public Lands, submitted the following report (to accompany H. R. 5006):

The Committee on the Public Lands has had under consideration H. R. 5006, a bill to add certain lands to the Sequoia National Park, Calif., and to change the name of said park to Roosevelt National Park, and do recommend that the said bill as amended by the committee do pass.

The amendments proposed by the committee are as follows:

Amendment No. 1: Strike out all of section 1 after line 8, page 1, down to and including line 3, page 9, and insert in lieu thereof the following:

Beginning at the present southeast corner of the Sequoia National Park, which is the township corner common to townships eighteen and nineteen south, ranges thirty-one and thirty-two east of the Mount Diablo meridian, California, thence east following the township line to the intersection of the township line between townships eighteen and nineteen south, range thirty-four east, with the hydrographic divide formed by Kern Peak between the South Fork of Kern River and Golden Trout Creek; thence northerly and easterly along said hydrographic divide to the summit of the Sierra Nevada Mountains; thence northerly and westerly along the main crest of the Sierra Nevada Mountains to the summit of Mount Pliske (thirteen thousand three hundred and twenty-eight feet); thence southwesterly along the hydrographic divide (Goddard Divide) between the drainage of the South Fork of San Joaquin River and the drainage of the Middle Fork of Kings River to the summit of Mount Reinstein (twelve thousand six hundred and ninety-five feet); thence southerly and westerly along the hydrographic divide between Goddard Creek and the drainage of the North Fork of Kings River, and along the divide between Crown Creek and Blue Canyon Creek, along Kettle Ridge to Kettle Dome; thence southwesterly along the hydrographic divide to the junction of Crown and Fawn Creeks; thence westerly along the hydrographic divide between Fawn Creek and Rodgers Creek to Obelisk Peak; thence westerly along the main hydrographic divide south of Rodgers Creek to Spanish Mountain (triangulation station, United States Geological Survey, bench mark ten thousand and forty-four feet); thence southerly along the hydrographic divide (Deer Ridge) to the junction of the South and Middle Forks of Kings River thence southeasterly along the south bank of the South Fork of Kings River to its junction with the west bank of Boulder Creek; thence southeasterly along the west bank of Boulder Creek to its intersection with the range line between townships fourteen south, ranges twenty-nine and thirty east; thence south on said range line to its intersection with the present north line of the Sequoia National Park; and all of those lands lying between the boundary line last above described and the present east and north boundary lines of said national park are hereby included in and made a part of the Roosevelt National Park.

Amendment No. 2: On page 9, line 4, strike out all of section 2 down to and including line 12, and insert in lieu thereof the following:

Said park shall be under the exclusive control of the Secretary of the Interior, whose duty it shall be, as soon as practicable, to make and publish such reasonable rules and regulations, not inconsistent with the laws of the United States, as he may deem necessary or proper for the care, protection, management, and improvement of the same, such regulations being primarily aimed at the freest use of said park for recreation purposes by the public and for the preservation from injury or spoliation of all timber, natural curiosities, or wonders within said park and their retention in their natural condition as far as practicable, and for the preservation of said park in a state of nature so far as is consistent with the purposes of this act. Such rules and regulations shall permit the taking of fish by hook and line from the streams or lakes in said park, but at such seasons during such times and in such manner as may be directed by the Secretary of the Interior. Such rules and regulations, however, shall provide against the wanton destruction of the fish and game within said park and against their capture or destruction for purposes of merchandise or profit, and the Secretary of the Interior shall generally be authorized to take all such measures as shall

be necessary to fully carry out the objects and purposes of this act. Said Secretary may, in his discretion, execute leases to parcels of ground not exceeding 10 acres in extent at any one place to any one person or persons or company for not to exceed 20 years, when such ground is necessary for the erection of buildings for the accommodation of visitors. Such leases or privileges may be renewed or extended at the expiration of the terms thereof: *Provided*, That existing leases from the Department of Agriculture may be continued in the discretion of the Secretary of the Interior for so long as such extension is not detrimental to the public purposes for which the park is created.

Amendment No. 3: At the end of section 4, page 9, line 21, change the period to a semicolon and add:

Provided, That under rules and regulations to be prescribed by him the Secretary of the Interior may issue permits to any bona fide claimant, entryman, landowner, or lessee of land to secure timber for use on and for the improvement of his land; and he shall also have authority to issue, under rules and regulations to be prescribed by him, grazing permits and authorize the grazing of live stock on the lands within said park, at fees not to exceed those charged by the Forest Service on adjacent areas, so long as such timber cutting and grazing are not detrimental to the primary purpose for which such park is created.

Amendment No. 4: Add a new section to be known as section 5, as follows:

Sec. 5. No exclusive privilege shall be granted within said park, or on or over the roads and trails therein, except upon ground leased for the erection of buildings or camps thereon.

Amendment No. 5: Add a new section to be known as section 6, as follows:

Sec. 6. The act of June 6, 1900, Thirty-first Statutes, page 618, so far as the same applies to the use or employment of United States troops in any national park, is hereby repealed.

Amendment No. 6: Add a new section to be known as section 7, as follows:

Sec. 7. Any person found guilty of violating any of the provisions of this act or any rule or regulation that may be promulgated by the Secretary of the Interior with reference to the management and care of the park, or for the protection of the property therein, for the preservation from injury or spoliation of timber, natural curiosities, or wonderful objects within said park, or for the protection of the animals, birds, and fish in the said park, shall be deemed guilty of a misdemeanor, and shall be subjected to a fine of not more than \$500 or imprisonment not exceeding six months, or both, and be adjudged to pay all costs of the proceedings.

The bill accomplishes two purposes, namely, to enlarge the present boundaries of the Sequoia National Park in California and to designate the park hereafter by the name of "Roosevelt National Park," in honor of Theodore Roosevelt, late President of the United States.

The present Sequoia National Park contains an area of approximately 250,000 acres, and includes the most notable groves of giant sequoias in the world. The new area added by the present bill comprises about 850,000 acres and adds to the park an alpine territory of unexcelled grandeur.

Amendment No. 1 changes the boundaries of the proposed enlarged park from those contained in the bill, and eliminates about 150,000 acres of land which will still remain under the jurisdiction of the Forest Service of the Agricultural Department. This restriction in area was made in order to meet, so far as possible, the objections of the Department of Agriculture to the proposed bill.

By reference to the letter of the Secretary of Agriculture hereinafter set forth, it will be noted that the creation of the enlarged park under the new name is indorsed, but that it was suggested that certain areas included in the proposed bill should be eliminated. Amendment No. 1 substantially meets this suggestion of the Secretary of Agriculture and excludes from the bill large private holdings of forest lands.

Amendment No. 2 gives the proper administrative authority to the Secretary of the Interior for the government of the park. The substance of this amendment is practically the same as the matter stricken out. It was deemed more advisable, however, by the committee to set forth in detail the authority of the Secretary of the Interior rather than to base such authority upon the general legislative enactments mentioned in section 2 as originally proposed in the bill. The amendment is in accord with the administrative authority granted to the Secretary of the Interior in other national parks of the country.

Amendment No. 3 is designed to give reasonable privileges under proper regulation to persons owning property inside the park or living adjacent thereto and to permit such persons, under proper rules and regulations, to secure timber for use on their holdings and to graze live stock in the park. It will be noted, however, that both of these privileges are subject to the discretion of the Secretary of the Interior.

Amendment No. 4 provides against the granting of exclusive privileges over the roads or trails in the park or upon any of the ground in the park except ground leased for the erection of buildings or camps for park purposes or for the convenience of park visitors.

Amendment No. 5 repeals the act of June 6, 1900 (31 Stat., 618), so far as the same applies to the use or employment of United States troops in any national park. The use of such troops has long since been discontinued, but, in view of the complaint by the residents of California on account of alleged arbitrary action of troops in the park, it was deemed advisable to revoke the authority contained in the act of June 6, 1900.

Amendment No. 6 provides a penalty clause for the violation of any of the provisions of the act or of any rules or regulations that may be promulgated by the Secretary of the Interior with respect to the park. This amendment is the same as that to be found in the various acts relating to national parks.

It will be noted that sections 3 and 4 of the bill have not been amended. Section 3 provides that nothing in the act shall in any way modify or affect the mineral-land or coal-land laws now applicable to the lands added to the park, and section 4 provides that this act shall in no wise affect any valid existing claim, location, or entry under the land laws of the United States or the rights of any claimant, locator, or entryman to the full use and enjoyment of his land.

The bill is approved by the Secretary of the Interior, and his letter sets forth the unexcelled scenic attractions of the enlarged park.

The reports on the bill of the Secretary of the Interior and the Secretary of Agriculture, respectively, are as follows:

DEPARTMENT OF THE INTERIOR,
Washington, February 21, 1920.

MY DEAR MR. SINNOTT: I have your request of February 5 for a report on H. R. 5006, a bill to add certain lands to the Sequoia National Park, Calif., and to change the name of said park to Roosevelt National Park.

This bill is identical in form and substance with S. 2021, Sixty-fifth Congress, as that measure was passed by the Senate on January 16, 1919. I indorsed that bill not only in a formal department report, but also in a personal statement made to your committee after the measure had passed the Senate.

In this hearing I fully explained the plan of extending the present Sequoia National Park and stated that it was my belief that no more fitting tribute to Theodore Roosevelt's noble influence upon American ideals or more enduring record of his inspiring personality could be devised than to associate his memory with a people's park, making forever accessible for succeeding generations the nature that he loved and sought and drew his strength from.

I am still of the opinion that this mountain group, the loftiest within the borders of the United States, formed of enduring granite and clothed below the timber line with giant trees, should be dedicated as the Roosevelt National Park, to tell permanently what this distinguished man was and stood for and of the people's affection for him.

In my report on the legislation of the Sixty-fifth Congress I made the following statement regarding the scenic character of the territory included in this park project and the reasons why it should be given a park status:

"Sequoia National Park as now constituted was set apart in 1890 to preserve several magnificent groves of giant sequoia trees (*Sequoia washingtoniana*), the finest of which, the Giant Forest, is to-day the chief feature of interest to the visitor. The territory that would be added to this park by the enactment of the bill under consideration is approximately 1,300 square miles in extent and lies mostly east and north of the boundaries as now established.

"Scenically this country is unexcelled of its kind in the United States. Its eastern boundary follows the crest of the Sierra Nevada Mountains from a point 55 miles below the Yosemite National Park's southern boundary southward to and including the climax of the Sierra, which is the mountain grouping in the neighborhood of our loftiest summit, Mount Whitney. In kind it is similar to Yosemite, but differs materially in variety, in climax, and particularly in the extraordinary massing of the peaks. Its small glaciers are many. Its granite cirques have unusual size and majesty. Lofty precipices abound. Interesting volcanic phenomena add to its picturesqueness and scientific significance. I know of no country of similar magnificence whose fastnesses can be penetrated and enjoyed with similar comfort because of the practical absence of rain during the summer months. Few trail travelers carry tents.

"The slopes falling from this crest to the western boundaries of the proposed addition have equal distinction. This is an area of tumbled cross ranges holding between them canyons of exceptional wildness and charm. The number and variety of lakes is the travelers' constant surprise. The rivers formed by the confluence of innumerable cascading streams pass through gorges several of which are comparable in magnificence only to the Yosemite Valley. 'There are many Yosemite's,' writes Muir, and the several next in order of beauty are surely here. For sheer grandeur Tehlpite may even excel Yosemite. The rock walls of the Tehlpite Valley and the Kings River Canyon frequently exceed Yosemite's in height. Those of Kern Canyon, Paradise Valley, and Fish Valley are only a little less. Tehlpite Dome, the Grand Sentinel, and other outstanding rocks bear scenic comparison with Yosemite's greatest rock features and are likely to become as celebrated.

"I use the comparison only because of public familiarity with Yosemite. This country is no repetition. It is highly individual and different. But even if it were repetition, a sound reason for this additional reservation would still exist. The generation is not far ahead which will need two Yosemite's for its use and pleasure.

"Finally, there is a reason founded upon proportion and relationship. It seems to me that there is a peculiar fitness in adding to the distinction of Sequoia's forests of giant trees and further distinction of this colossal massing of mountains and of these extraordinary canyons. The common note is apparent. To unite them is to complete a whole, to create a national park in the superlative degree.

"All of this country is covered at the present time by forest reservations, a part of it being in the Sequoia National Forest and a part in the Sierra Forest. There is little opportunity for commercial development of this region. Much of it is far above timber line and practically no part of it lies below the 7,500-foot contour line. It is useless for farming purposes, although the mountain meadows are largely utilized for the pasturage of live stock during the summer months.

"The region is not accessible longer than four months of the year. The snowfall is heavy in winter. It closes the passes early in autumn and opens them by its disappearance late in the spring. Magnificent as it is in the summer months, when this region can be visited and enjoyed by the lover of the mountains, it is a forbidding land at all other times."

There is some merchantable timber on the outskirts of the territory covered by this bill, but it should be preserved to protect the watersheds of the rivers and creeks and to complete the scenic features of the park. Part of this timber is of the giant sequoia species, two fine groves of these great trees standing only a short distance from areas now being cut over. It is unnecessary to remark that this timber should be safeguarded forever.

Under section 2 of the bill, water power and grazing permits may be granted where the development of power and the use of park lands for the pasturage of cattle "is not detrimental to the primary purpose for which the park was created." This section refers to the National Park Service act of August 25, 1916 (39 Stat., 635), which in section 4 specifically provides that nothing therein shall affect the act of February 18, 1901 (31 Stat., 790).

There is danger that private rights may be acquired in strategic portions of this territory, owing to the fact that such rights are now obtainable within national forests. For any portion of the floor of the main Kings River Canyon, Tehlpite, and Paradise Valleys, and other Yosemite-like valleys, to be acquired by private interests to the exclusion of the public would be a serious national loss. At the present time, fortunately, there are comparatively few private holdings in the region.

Last year I sent to the committee a map showing the patented and unperfected entries, State lands, pending selections, and reconveyances, rights of way, and administrative site withdrawals. A list of these entries, selections, etc., with names of entrymen, as shown by the records of the General Land Office, was also transmitted for the committee's use. The total alienated area is 30,295.97 acres, of which 11,240 acres are bases of pending lieu selections under the act of June 4, 1897 (30 Stat., 38), and 2,010 acres are bases of pending State school indemnity selections.

The inclosed map indicates the boundaries of the present Sequoia Park and the boundaries it would have if enlarged as proposed by the pending measure.

I have no objection to offer to any of the provisions of the bill, and I heartily commend this legislation to the favorable consideration of your committee.

Cordially, yours,

FRANKLIN K. LANE, Secretary.

Hon. N. J. SINNOTT,

*Chairman Committee on the Public Lands,
House of Representatives, United States.*

FEBRUARY 21, 1920.

Hon. N. J. SINNOTT,

*Chairman Committee on the Public Lands,
House of Representatives.*

DEAR MR. SINNOTT: Receipt is acknowledged of your letter of February 5, inclosing a copy of the bill H. R. 5006, "To add certain lands to the Sequoia National Park, Calif., and to change the name of said park to the Roosevelt National Park," upon which you ask that this department submit a report and upon which your committee will hold hearings on February 24, and suggest that this department send a representative.

The measure proposes, in substance, that the present area of the Sequoia National Park, which comprises 169,600 acres, be enlarged by adding to it approximately 850,000 acres of land now within the Sequoia and Sierra National Forests. The total acreage of the park, as enlarged, would comprise something over 1,000,000 acres. The purpose of the extension is to bring under national park administration the scenic areas to the west of Mount Whitney, in the canyons of the South and Middle Forks of the Kings River, and the canyon of the Kern River. It is further proposed that the park shall bear the name of "Roosevelt National Park," in honor of Theodore Roosevelt.

During the last session of Congress, this department was requested to report on a measure to enlarge the Sequoia National Park to the limits proposed in H. R. 5006. In the report, dated December 30, 1919, the department stated that it could not concur in the lines as proposed in the bill, and suggested that action be deferred until further examination could be made.

During the past season studies on the ground were made by representatives of the Forest Service, and Secretary Houston personally visited portions of the area. These studies confirmed the belief of the department that the establishment of the park is both justified and desirable, provided the lines are drawn in such a way as not to include areas which, from the standpoint of the permanent use of other resources, should better remain under national forest rather than national park administration. The lines as proposed in H. R. 5006 comprise considerable areas whose character does not, in our opinion, justify their inclusion in the national park, and whose use under national forest administration is closely related to the welfare and building up of the agricultural interests of the region.

The proposed park includes a very large amount of forest land whose use under scientific methods of forestry will ultimately be needed in connection with the building

up of the industries of the San Joaquin Valley. Most of it is so located that it does not appear necessary in connection with the administration of the national park. It is believed that the Forest Service is the logical organization to handle public forests and that there would be no justification for transferring jurisdiction over large blocks of timber to another department. The use ultimately of the timber under right methods of forestry can be carried on without jeopardizing in any way the scenic values of the region. It has always been the policy of the Forest Service to reserve from cutting all sequoias and, in connection with them, such other trees as are necessary for a proper scenic setting.

There are certain portions of the proposed park, further, which are used at the present time by cattle in connection with the ranches in the lower valleys. For several years, and particularly during the war, a considerable number of sheep were ranged in the high portions of the area in question. The plans of the department, however, call for the exclusion of sheep from this section. The relation of the mountain forage to sheep is quite different from that to cattle. The effect of the exclusion of cattle would be detrimental to many small ranches. There are within the area of the proposed park approximately 6,500 cattle and horses grazing under permit. A large part of the permittees are small men who have been undertaking to build up ranches in the foothills. In the majority of instances the privilege of grazing cattle in the national forest is essential to the success of maintaining these foothill homes; and the exclusion of these privileges will mean in a large number of cases not only great injury to these small ranchers but probably failure. It happens that most of the lands needed for the grazing of cattle are not of a scenic character that justifies their transfer to the status of a national park.

The net result of the investigations is to convince the department that the measure has not given sufficient consideration to broad economic interests of the region. Lands long withdrawn and established as national forests, which are chiefly valuable and urgently needed for timber production and forestry and for range utilization, should be maintained and administered as national forests unless some urgent public reason makes their transfer to another jurisdiction for some other use necessary. No such urgency or necessity is known to exist in this case.

It had been hoped that the principle above referred to might form the basis for an agreement between the two departments as to policy and the boundary line for the proposed Roosevelt National Park. It has not been possible as yet to reach such an agreement. This department would willingly indorse a measure transferring from the national forest to the proposed Roosevelt Park such areas of major scenic importance as are essential. We can not concur, however, in the present boundary lines which include areas which in the department's belief should, in the interest of the agricultural and other economic needs of the region, be retained and administered as national forests.

In view of the fact that the two departments are in agreement as to the desirability of establishing a park in the Mount Whitney region, it is believed by this department that action may wisely be deferred until there can also be an agreement as to the policy of what land should be included and a joint recommendation made as to exact boundary lines.

Very truly, yours,

E. T. MERRITH, *Secretary.*

[Senate Report No. 418, Sixty-sixth Congress, second session.]

CRATER LAKE NATIONAL PARK, OREG.

February 4, 1920.—Ordered to be printed.

Mr. McNary, from the Committee on Public Lands, submitted the following report (to accompany S. 2797):

The Committee on Public Lands, to whom was referred the bill (S. 2797) to add certain lands to the Crater Lake National Park, Oreg., having considered the same, report favorably thereon with the recommendation that the bill do pass without amendment.

The necessity for the enlargement of the park is fully set forth in the report of the Acting Secretary of the Interior, addressed to Hon. Reed Smoot, chairman of the committee, November 29, 1919, which is appended hereto and made a part of this report.

DEPARTMENT OF THE INTERIOR,
Washington, November 29, 1920.

MY DEAR SENATOR: I have received your request of August 18 for a report on Senate bill 2797, Sixty-sixth Congress, first session, "A bill to add certain lands to the Crater Lake National Park, Oregon." This bill is identical with S. 4288, introduced during the Sixty-fifth Congress, second session, on April 6, 1918.

Crater Lake National Park as at present constituted, while containing one of the most striking scenic attractions of the whole world, is known as the park with only the one attraction, namely, the immense volcanic crater containing the lake, which gives the park its name. For this reason it does not draw the visitor as do some of the other parks with diversified scenery. There is a small hotel and a small camp, but the average tourist spends only a few days at a time in the park. By enlarging the park northward as contemplated, important new attractions will be added: Diamond Lake, flanked by the snowy crest of Mount Thielsen on the east and the rugged outline of Mount Bailey on the west, will be a fit complement to the giant crater to the south and fulfill the ultimate destiny of the park as a gathering ground for the people. The country about Diamond Lake is undoubtedly one of the finest potential summer resorts

in the entire Cascade range. There is excellent fishing in the lake. The broad open grass-covered reaches and the numerous small streams in the neighborhood offer unexcelled camping sites. The lake itself is so shallow at places that the bather can walk for hundreds of feet into the water without danger. This fact, together with the sandy beach, and the fact that despite its elevation of 5,200 feet, the water is warm enough for comfortable bathing, will constitute this lake one of the most pleasing and popular features of the whole park.

The enlargement of the park will make possible the development of all conveniences for the traveling public, such as good roads, first-class transportation, additional and adequate hotel and camping facilities, and particularly free public camps which have proven so popular in other parks. More roads can be built within the enlarged park and the peculiar topography of the land will permit of easy construction; a road between Diamond Lake and Crater Lake will be but a logical and natural development, and one of the best scenic roads in the entire country. Furthermore, as the Central Oregon Highway, running from Klamath Falls through Bend to The Dalles, where it connects with the Columbia Highway, is in such close proximity to Crater Lake National Park, additional road extensions with the cooperation of the State running by easy grades into the enlarged park are to be developed; already a passable road on this highway leads from Beaver Marsh, below Crescent, to Diamond Lake, and this with very little additional effort can be developed into an interesting highway into this enlarged park area; this would stimulate tourist automobile travel through central Oregon, and would make the visitor to the national parks much better acquainted with this interesting but less known section of the State.

The proposed addition will also afford a large measure of protection to the wild animal life of the park. The deer and the bear, for instance, become tame in the park, go down into the lower Diamond Lake country as the snow drives them from the higher altitudes, and fall easy prey to the hunter. They must be protected beyond the present park limits. From the standpoint of wild life conservation the proposed measure therefore will also perform an important national duty.

The land covered by the proposed extension embraces practically no grazing areas, and there are no alienated lands involved. The State has selected indemnity lands for the school sections in this area. There is also no merchantable timber within the limits. The boundaries of the territory involved are clearly indicated on the map attached hereto. The present area of Crater Lake National Park is 249 square miles, or 159,360 acres. The area of the proposed addition is approximately 145 square miles, or 92,800 acres, making the total area of the enlarged park 394 square miles, or 252,160 acres. All the lands to be included lie within the Crater, Umpqua, and Deschutes National Forests, and within Klamath and Douglas Counties.

With the following suggestions for minor amendments made, the proposed measure has my indorsement, and I heartily recommend its early passage.

On page 1, line 3, add the word "east" after "west."

On page 3, line 6, insert the words "the boundary line above described and" after the word "between."

Cordially, yours,

ALEXANDER T. VOGELSANG,
Acting Secretary.

Hon. REED SMOOT,
Chairman Public Lands Committee, United States Senate.

[Senate Report No. 500, Sixty-sixth Congress, second session.]

IRRIGATION EASEMENTS IN YELLOWSTONE NATIONAL PARK.

April 3, 1920.—Ordered to be printed.

Mr. Smoot, from the Committee on Public Lands, submitted the following report (to accompany S. 3895):

The Committee on Public Lands, to whom was referred the bill (S. 3895) authorizing the granting of certain irrigation easements in the Yellowstone National Park, and for other purposes, having considered the same, report favorably thereon with the recommendation that the bill do pass without amendment.

The bill was referred to the Interior Department, the Acting Secretary of which furnished the following report on the same:

DEPARTMENT OF THE INTERIOR,
Washington, March 6, 1920.

MY DEAR SENATOR: I have your request of February 11 for a report on S. 3895, "A bill authorizing the granting of certain irrigation easements in the Yellowstone National Park, and for other purposes."

I have carefully examined this measure in the light of the policies of this department with respect to the protection of the natural conditions of the national parks, and I have reached the conclusion that no objection to the passage of the bill should be interposed by me, for the reason that, no easements for irrigation purposes in the Falls River Basin, Yellowstone National Park, must be granted by the Secretary of the Interior under the provisions of this legislation unless he first finds that such easements will not bring detriment to or interference with the uses of the land involved for park purposes.

Cordially, yours,

ALEXANDER VOGELSANG,
Acting Secretary.

Hon. REED SMOOT,
*Chairman Committee on Public Lands,
United States Senate.*

[House Report No. 767, Sixty-sixth Congress, second session.]

IRRIGATION EASEMENTS IN THE YELLOWSTONE NATIONAL PARK.

March 25, 1920.—Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Smith of Idaho, from the Committee on the Public Lands, submitted the following report (to accompany H. R. 12466):

The Committee on the Public Lands, to whom was referred H. R. 12466, has carefully considered the same, and recommends the passage of the bill, with the following amendments:

1. Page 1, line 3, after the word "ditch" strike out the word "company."
2. Page 1, line 4, after the word "associated" insert the word "corporation."
3. Page 1, at the end of line 5, insert the words "and formed for mutual benefit and not for profit."
4. Page 1, line 7, strike out the word "Southeastern" and insert the word "Southwestern."
5. Page 1, line 9, strike out the word "water" and insert the word "irrigation."
6. Page 2, line 4, after the word "purposes" insert the following: "*Provided, That all expenses incurred by the United States in connection with such grant or in the administration of this act shall be borne by the grantee.*"
7. Page 2, line 6, after the word "way" insert the words "and designate the location."
8. Page 2, at the end of line 8, insert the words "at its own cost and expense."
9. Page 2, line 14, after the word "that" strike out the words "said lines" and insert in lieu thereof the words "telephone and telegraph lines and said roads and bridges."
10. Page 2, line 22, after the word "conduits" insert the words "roads, bridges, telephone and telegraph lines."
11. Page 3, at the end of line 19, strike out the period and insert a semicolon and add the following:

Provided, That if the grantee fails or refuses to commence the construction of such works within a reasonable time after its application has been approved or to prosecute such work with due diligence thereafter or to comply with the provisions of this act or any of the rules or regulations authorized herein, then all its rights shall be forfeited and shall revert to the United States.

The farmers occupying the Upper Snake River Valley lost during last season, because of the shortage of the water supply, between \$10,000,000 and \$15,000,000 worth of crops, which resulted in the movement on their part to augment the water supply by a storage reservoir. The only site available for such storage is in the extreme southwestern corner of the Yellowstone National Park, a section which is marshy in its character and which is never visited by tourists because of the lack of roads or trails. Application was made to the Secretary of the Interior for a right of way for a reservoir under the general law affecting easements on the public domain, and after careful consideration the Secretary stated he was in doubt in regard to his authority to grant such a permit of easement under the general law and submitted proposed legislation, which is embodied in the bill under consideration, which gives the Secretary of the Interior authority to grant the necessary right of way in the extreme southwestern corner of the Yellowstone National Park for the construction of a reservoir, canals, etc., for the purpose of storing water for the purpose of irrigation.

It is specifically provided that the road to be constructed from the park boundary to the site of the reservoir shall be maintained at the expense of the grantees, who shall also permit the use of any telephone or telegraph lines which may be constructed. Also that timber within the limits of the reservoir shall be cut and removed so as not to mar the attractiveness of the reservoir, and that all plans and specifications shall be submitted and approved by the Secretary of the Interior before construction. Also that the Secretary of the Interior shall make and enforce rules and regulations necessary to carry into force and effect the purposes of the act and to protect and preserve, in so far as consistent therewith, the beauty of said park.

The proposed legislation simply confers upon the Secretary of the Interior authority to approve the application for a right of way if, in his judgment, such action should be taken.

The approval of the Acting Secretary of the Interior of the proposed legislation is set forth in the following letter addressed to the chairman of the Committee on Public Lands:

DEPARTMENT OF THE INTERIOR,
Washington, March 6, 1920.

MY DEAR MR. SINNOTT: I have your request of February 13 for a report on H. R. 12466, entitled "A bill authorizing the granting of certain irrigation easements in Yellowstone National Park, and for other purposes."

I have carefully examined this measure in the light of the policies of this department with respect to the protection of the natural conditions of the national parks, and I have reached the conclusion that no objection to the passage of the bill should be interposed by me, for the reason that no easements for irrigation purposes in the Falls River Basin, Yellowstone National Park, must be granted by the Secretary of the Interior under the provisions of this legislation unless he first finds that such easements will not bring detriment to or interference with the uses of the land involved for park purposes.

Cordially, yours,

ALEXANDER T. VOGELSBANG,
Acting Secretary.

Hon. N. J. SINNOTT,
Chairman Committee on the Public Lands,
House of Representatives.

The following are the reasons upon which the importance of the proposed legislation is based:

1. There are about 30,000 people residing on farms, which are now in a high state of development and cultivation and in need of additional water supply in order to secure the maximum crops. The area affected is about 200,000 acres, situated in Fremont and Madison Counties, Idaho.

Except during dry years, these lands are fairly well supplied with water, but during the periods of drought a great shortage of crops is experienced.

2. A careful examination of the watershed has been made by the officials of the State of Idaho and the engineers, which examinations disclose the fact that this reservoir site in the Yellowstone National Park on Fall River is the only site which can be utilized in providing an additional water supply for the land in question.

3. On account of the peculiar conditions surrounding this site, its location, etc., the reservoir can be constructed and operated without any interferences whatever with the park.

The area intended to be used by this reservoir is of a swampy character and contains nothing whatever of interest. When this reservoir is constructed this swamp will be converted into a beautiful mountain lake.

4. There is absolutely nothing in the way of unusual scenery or other interesting features in this part of the park, but the entire area contains only the ordinary western mountain landscape scenes, such as may be seen along the lines of travel for many miles by any tourist approaching the park from any direction.

This part of the park is not on the line of tourist travel and is never visited by the tourists on account of the topographic conditions; none of the tourist routes through the park ever reach this territory, as there is nothing of unusual interest to induce the tourist travel to visit this section.

During recent years, particularly 1919, a considerable menace existed to the entire Yellowstone National Park from forest fires. One of the fires most difficult to control occurred at the headwaters of Fall River, and was only extinguished with great difficulty, owing to a lack of roads and a means of access. When this easement is granted, a highway will be constructed from the railroad station at Ashton or Marysville to this part of the park, in order that they may gain access to their work. This highway will serve as a means of access to the park for fire protection and other purposes for all time to come.

5. Like many of the other Western States, Idaho is dependent entirely on the development of its agricultural resources by irrigation for further growth and prosperity. This development can only progress by the conservation of our water resources through the construction of storage reservoirs. Such reservoirs obviously can only be constructed where favorable sites exist and where adequate water supply is available.

6. Little need be said concerning the necessity of increasing the food production of the Nation and the world, but the following brief summary covers the crop production from this territory: Sugar beets, wheat, oats, barley, peas, and other seeds, together with large quantities of forage for cattle and sheep, and potatoes and other vegetables are grown in large quantities.

The aggregate loss in crop failures, due to the shortage of water during 1919 on the lands which it is intended to irrigate from this reservoir, not including the loss in cattle, sheep, and other live stock, aggregated more than \$15,000,000.

The growing of sugar beets as an industry in this part of the country is one of the most important, and owing to the shortage of water, all of which would have been avoided had this reservoir been in existence, this crop was not more than 40 per cent of the normal during 1919. The estimated loss of sugar beets in this territory during that year is about \$5,000,000.

7. This reservoir site is not desired by any corporate interest for corporate profit, but by the farmers, who are organized and will furnish all the money to construct the necessary works, and its use will be entirely devoted to the creation of happy farm life and prosperity. At this particular time when extreme congestion occurs in our cities and congested centers of population, it is highly important that special inducement be offered to increase the rural population and relieve these congested centers.

8. At a time when the world is largely filled with unrest, due to the radical activities in Russia and elsewhere, to say nothing of our own Nation, it is well to remember that the owners of farm property and the people who are tilling their own soil are not radicals, but really constitute our most loyal and patriotic American citizens. In this respect it is therefore important to further increase our farm areas and build up our rural communities.

When this reservoir is constructed, the adequate water supply provided thereby and the increased production resulting therefrom will permit of material reduction in the present farm units in this territory and thus build up additional homes for many people.

Mr. Arthur P. Davis, Director of the Reclamation Service, who has visited this section of the park, stated to the committee that this section is of a marshy character, and that it is of the greatest importance that the water be conserved as proposed for irrigation purposes. The director has also submitted the following letter:

DEPARTMENT OF THE INTERIOR,
UNITED STATES RECLAMATION SERVICE,
Washington, D. C., March 18, 1920.

HON. ADDISON T. SMITH,
Acting Chairman Committee on Public Lands,
House of Representatives.

MY DEAR MR. SMITH: In accordance with your request over the telephone this morning, I am submitting the following information concerning the reservoir site known as Fall River Meadows or Bechler Swamp in the southwestern corner of Yellowstone Park.

This site is desired for the storage of water for irrigation by farmers along the North Fork of Snake River in Idaho, and it is well adapted to the purpose. The region is partly covered with timber of little value and is, in general, swampy. A low range of hills passes through the swampy area, and by closing the gaps in these hills it is possible to store a large quantity of water for irrigation. The land that would be submerged by the lake thus formed is mostly of a swampy nature and is unsightly and without any scenic value or economic value that is comparable to its value as a reservoir.

The lake that would be formed would be more pleasing to the eye than the natural swamp and would eliminate a considerable area of mosquito-breeding territory. If the embankments proposed to form this reservoir are built in a workmanlike manner and the construction camps and equipments properly cleaned up, the proposed work will be a distinct improvement in the appearance of the region and the roads that will be necessary to construct and operate this reservoir will increase the accessibility of the southwestern portion of the park.

I know of no valid objections, either of a scenic or economic nature, to the proposed construction, and think by all means it should be allowed and encouraged by Congress.

Very truly, yours,

A. P. DAVIS, *Director*.

Mr. Stephen T. Mather, Director of the National Park Service, also addressed the committee and recommended the passage of the bill, with the statement that before the Secretary acted upon the application for a right of way, he and the superintendent of the national park would visit the Fall River Basin country and furnish the Secretary of the Interior full information which would enable him to take appropriate action on the application.

There are appended hereto a few of the many statements which have been furnished the committee from farmers and others as to the value of crops lost last season because of the shortage of water supply, which would have been saved had the proposed reservoir been constructed and water conserved for such an emergency in the way of the shortage of water as existed last summer.

STATEMENT OF DROUTH CONDITIONS DURING THE SEASON OF 1919 IN THE UPPER SNAKE RIVER VALLEY.

ASHTON, IDAHO, November 1, 1919.

I am farming 640 acres just south of Ashton; 800 acres sown to wheat, which with irrigation water available would have yielded not less than 12,000 bushels, brought

1,781 bushels; 250 acres sown to seed peas, which should have brought not less than 9,000 bushels, yielded 327 bushels, or considerably less than half the amount of seed planted; 20 acres of barley yielded 28 bushels, less than the amount of seed used; 32 acres of alfalfa hay, which with the ordinary amount of irrigation water available should have brought not less than 160 tons, brought 30 tons of very inferior hay.

The season of 1919, with its abundance of sunshine and warm weather should have been a record-breaking year, if farmers of this section could have only enjoyed the usual amount of water for irrigating their crops. The above estimates of yields are based on what my experience of 20 years of farming here leads me to expect and are low. Any season, when the farmers here are compelled to allow the waters in the rivers to go by and supply older rights, the same crop failure will virtually recur.

To reasonably safeguard future farming operations in this section, it is absolutely necessary to augment the present supply of irrigation water. The only location that is left would be the reservoir site in Fall River meadows.

G. HARRISFIELD.

STATE OF IDAHO, County of Madison, ss:

We, the undersigned, president and secretary of the Teton Island Canal Co., an irrigation corporation existing and operating in Madison County, State of Idaho, do hereby certify as follows:

That our losses on account of shortage of water during the year 1919 have at least been one-half of our entire crop and that we are badly in need of stored water for irrigation purposes, and we must have stored water to properly irrigate all tillable land under present irrigation system and unless we provide stored waters our losses will continue to be great hereafter. And we will be short of water the years that our snowfall is light.

We, the president and secretary of the above corporation, certify that the above statement is true and correct.

ALFRED RICKS, *President*.
JAMES A. BERRY, *Secretary*.

Subscribed and sworn to before me this 5th day of November, 1919.

[SEAL]

W. E. GEE,
Notary Public, Reaburg, Idaho.

My commission expires January 16, 1922.

STATE OF IDAHO, County of Madison, ss:

Ross J. Comstock, being first duly sworn, deposes and says:

That he is the president of the First National Bank of Roxburg, Madison County, State of Idaho, and has for the past 19 years lived continuously in the said Madison County.

That during all the said time, he has been identified with said bank and its predecessors, and that in the managing of said business he is personally and well acquainted with the irrigation conditions of said county.

The affiant further states that located in Madison County is 80,000 acres of irrigated lands, which are capable of being irrigated from the water supply of the North Fork of Snake and Teton Rivers; that during the said time on numerous occasions, more or less of said lands have suffered from lack of irrigation water and the farmers have sustained material losses through failure to secure necessary water for irrigation purposes.

The affiant further states that this has been especially the condition during the irrigation of 1919 and that all of said lands have suffered from lack of water for irrigation and he would estimate that said loss would exceed \$25 to \$100 per acre with a probable general average of \$35 to \$40 per acre.

The affiant further states that in the development of said Madison County that the more scientific farming and the diversification of crops requires that a greater amount of water be provided than in former years and that it is apparent that the only manner in which said water can be provided and due protection given to the irrigation districts of Madison County is through the storage of water at the heads of the water supply that flow through the valley, and released during the time that the regular flow of the rivers will not supply a sufficient amount of water for irrigation purposes.

The affiant further states that the irrigated portions of Madison County being sub-irrigated, that by reason of filling the ground to raise the water table to properly sub-irrigate said lands, creates a reservoir or storage of water and the return flow to the river is immeasurably valuable to the irrigation districts below.

R. J. COMSTOCK.

Subscribed and sworn to before me this 5th day of November, 1919.

[SEAL.]

FAY ABBOTT.

I, Joseph E. Romrell, hereby depose and say, that I am president of the Wilford Irrigation & Manufacturing Co., of Wilford, Fremont County, Idaho. That said company is a cooperative and non-speculative corporation operated solely for the purpose of irrigating the lands owned by the members of the company. That there is over 2,000 acres of cultivated land under the company's canal owned and operated by the stockholders of the corporation. That the value of the land of said tract ranges from \$125 to \$200 per acre. That due to scarcity of water during the present year of 1919 the farmers comprising this company have lost \$150,500 worth of crops as follows:

Wheat	\$68,000
Oats	8,500
Seed peas	50,000
Alfalfa hay	15,000
Grain straw and pea straw	3,000
Miscellaneous crops	8,000
Total	150,500

That we suffer yearly a shortage of water and extremely so such years as 1898, 1913, 1914, 1915, 1918, and the present year.

That we have joined in the formation of the Fremont-Madison Reservoir Co., subscribing \$20,000 stock therein, or 5,000 shares at \$4 per share, applying for 5,000 acre-feet of water annually through said reservoir company.

Witness my hand and seal at Willford (St. Anthony, R. F. D. No. 1), Fremont County, Idaho, this the 12th day of November, 1919.

JOSEPH E. ROMRELL.

STATE OF IDAHO, County of Fremont, ss:

On this 13th day of November in the year 1919, before me, Walter Riggs, a notary public in and for the State of Idaho, personally appeared Joseph E. Romrell, known to me to be the person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same.

In witness whereof, I have hereunto set my hand and affixed my official seal the day and year in this certificate first above written, at Teton, Idaho.

[SEAL.]

WALTER RIGGS, Notary Public.

STATE OF IDAHO, County of Fremont, ss:

I, E. Cunningham, being duly sworn, say that I am a resident of Ashton, Idaho, that I have lived here since 1906. I am a farmer by occupation and know the conditions existing in this country relative to the aridity and need of irrigation water.

During the years 1910, 1916, 1917, it was extremely dry in this section of the country and the crops were very short in the three first-named years, and practically a failure in the last-named year for the lack of irrigation water. The crops grown here are very small grains, hay, peas, beets, and vegetables. It is impossible to successfully grow hay, peas, beets, or any vegetables in almost any year without irrigation. This section of country, being among the last to be settled in the Snake River Valley, found the water all appropriated before it was settled, leaving us nothing but flood water. In order to overcome this shortage of water it is absolutely necessary that we be enabled to secure storage facilities to hold the flood water in order that we may be able to get the necessary water for irrigation.

E. CUNNINGHAM.

Subscribed and sworn to before me this 3d day of November, 1919.

[SEAL.]

HIRAM G. FULLER,
Notary Public.

ST. ANTHONY, IDAHO, October 30, 1919.

To whom it may concern:

We affirm that G. A. Fitzpatrick has been the manager of the St. Anthony Flour Mills, of St. Anthony, Idaho, and has resided at St. Anthony, Idaho, for the past six years, and that, as such manager, he has had occasion, due to the nature and interests of the grain business, to observe, more or less, the shortage of irrigation water at St. Anthony and in the surrounding vicinity. We further affirm that during the growing season of 1919 there was such a shortage of irrigating water in this part of Idaho that only about 15 per cent of a normal crop was grown, which could have been avoided if proper reservoir facilities were provided to take care of the flood waters in the spring of the year.

This is not the only year that this has occurred, as two years ago the same condition existed, but not nearly as severe as during the year 1919, as there were not as many acres under crop then as during the present year. This also was true in the year 1913, but the shortage was not as severe as in the years 1917 and 1919. This is due also to the fact that there was not nearly as large an acreage planted as during the war period, when each farmer exerted every effort to plant every available acre that was possible. It is true, however, that the irrigation water is not sufficient to grow successfully crops throughout this district without reservoir reservation of water, and for St. Anthony and surrounding territory to be successful there must, in the very near future, be obtained reservoir facilities large enough to store the flood waters in the spring to take care of that later demand, as it is the late water that matures the crops and makes the country successful.

Very truly, yours,

ST. ANTHONY FLOUR MILLS,
By G. A. FITZPATRICK, Manager.

EVERETT B. CLARK SEED CO.,
St. Anthony, Idaho, October 29, 1919.

John B. Davis, manager of the Everett B. Clark Seed Co., St. Anthony, Idaho, being first duly sworn deposes and says:

Following is a summary of our books of seed sown and crops grown from same during the past six years:

Year.	Pounds seed sown.	Pounds crop harvested.	Average fold.
1914.....	780,660	3,602,371	4.613
1915.....	606,162	3,447,395	5.685
1916.....	773,304	2,750,160	3.556
1917.....	786,530	2,138,808	2.708
1918.....	813,176	3,064,688	3.646
1919.....	761,226	1,645,365	2.163

The pea-growing sections in the United States as I know it are as follows: Parts of Wisconsin, Michigan, Montana, Washington, and Idaho. The two former are strictly dry-farm propositions, Washington partly, Montana and Idaho under irrigation, and without it very few, if any, peas can be successfully grown.

The Snake River Valley in Idaho has an ideal climate for pea growing, and with plenty of water it has no equal in the pea-growing game. Have been interested in pea growing in Canada, New York, Wisconsin, and Idaho, and have visited other sections during growing seasons.

Just to show what the scarcity of water did to some crops in this section this year: One of our growers, John F. Johnson, of St. Anthony, had two crops of peas for us, one crop that he had some water for—not enough, but enough to water parts of the field once. We paid him \$1,057.85 for that, and for the other that he had no water at all for he owed us \$108.94 for seed furnished him. In both cases land was the same. Cause: Shortage of water.

Others who had partial water:

J. S. Budd, Parker, Idaho—from 60 acres we paid him \$5,547.69.

Frank Fujimoto, St. Anthony—from 35 acres we paid him \$2,907.10.

C. W. Brown, St. Anthony—from 20 acres we paid him \$1,742.32.

Others with just as good land and farmers:

Paul Allan, Parker—17 acres; did not get seed back.

T. W. Barger, Newdale—16 acres, total failure.

Seth Bean, Newdale—40 acres; total failure on as good land as ever lay outdoors.

Could go on and cite dozens of others in the same boat, but this will show conditions. At Ashton, Idaho, normally without best producing sections, this year almost a total failure.

We are unable to give actual loss to the farmer or ourselves owing to water shortage this year, but it runs into the thousands of dollars. Our own loss is extremely large, not only in dollars, but in the loss of seed stocks that we have been years in breeding up, and perhaps we may never be able to replace.

Respectfully submitted.

JNO. B. DAVIS, *Manager.*

STATE OF IDAHO, County of Fremont, ss:

Daniel Thomas, being first duly sworn, deposes and says:

That he is a resident of Fremont County, State of Idaho, and a citizen of the United States, over the age of 21 years. That he has resided at Ashton, Idaho, since November, 1916, and is one of the copartners of the firm of Thomas Bros., grain buyers, with elevators at Ashton, Grainville, Driggs, Felt, and Tetonla, Idaho; that he has been engaged in the buying of grain for years, prior to 1916, in the State of Kansas. That during the year 1917 the firm of Thomas Bros. purchased at their elevators approximately 600,000 bushels of small grain of the approximate value of \$1,000,000; that during the year of 1918 they purchased approximately the same amount and of the same approximate value; that in the year 1919 they will be able to purchase, due to the fact that there is no more in the country, not to exceed 80,000 bushels, of the approximate value of \$45,000. The great difference in the amount purchased is due to the fact that in the year 1919 the shortage of water was so great that the canals of this section were shut off for the benefit of prior appropriators early in July of 1919; that this shortage of water has each year become more acute, due to the fact that sections with prior water right have become more highly developed, have used more intensive farming methods, entered industries requiring more water, and have become more densely populated.

That at the points where the firm of Thomas Bros. have elevators other firms have elevators, whose purchases this affiant has no means of determining definitely, but would judge ran about the same in volume and value as that of Thomas Bros.; that from his experience in the buying and handling of grain in other sections of the country your affiant is able to state that from his experience the section around Ashton is unsurpassed for the raising of small grain by any other section, either in quantity of yield per acre nor in quality.

That the soil of this section is very fertile and productive, adapted to the raising of various products, for which markets are being established, and is susceptible of being easily irrigated; that due to the establishment of markets for various products which are being raised and which will require irrigation more extensively than small grain has heretofore, more water than formerly is going to be required for the proper development of the country, so that instead of the present supply of water becoming more adequate by the change to production other than the raising of grain, such supply will become further inadequate; that to insure the future development of this section, or even to maintain its present development, the water that pass by in winter months will be required to be stored, and your affiant verily believes that the only solution to the problem is the construction of the proposed reservoir for storage water in Fall River Meadows, in Yellowstone Park; that by such construction the future development of Upper Snake River Valley is assured, but that without such construction this section must become of no great importance in production.

DANIEL W. THOMAS.

Subscribed and sworn to before me this 1st day of November, 1919.

[SEAL.]

THOS. B. HARGIS,
Notary Public.

STATE OF IDAHO, County of Fremont, ss:

W. L. Miller, being first duly sworn, deposes and says:

That he is the president and general manager of Miller Bros. Co., a corporation of the State of Idaho, engaged in the business of buying and selling grain.

That he has been engaged in the grain business in the city of St. Anthony continuously since the year 1900, and during all that time has bought and sold grain, and at times potatoes, hay, and feed. That during a large portion of the time he has been engaged in business the concern has operated and now are operating at seven different points on the branch of the Oregon Short Line Railroad, running from Idaho Falls,

Idaho, to Yellowstone, Wyo., and to Victor, Idaho, all of which points, with the exception of one, are in the irrigated section of the Upper Snake River Valley and in the territory irrigated by the waters of Fall River and the North and South Forks of Snake River and tributaries.

That in the early period of the time that he has been engaged in said business the territory tributary to the points at which they operate produced largely grain, but of recent years the crops produced in this territory become very much diversified, and since more and different kinds of crops have been raised, such as sugar beets, potatoes, seed peas, etc., and the grain crops have steadily declined in acreage.

That the crops last above mentioned require irrigation later in the year than do the grain crops, and several years have occurred in which the crops of beets, potatoes, peas, and other late crops have not properly matured because of the lack of sufficient water in the later part of the season, and particularly in the years 1916 and 1919, during which years the crops of grain and also the later maturing crops suffered extensively from want of irrigation. The crop of 1916 being estimated as 50 per cent short and the crop of 1919 being estimated as no more than 15 per cent of the normal yield for the territory embraced in the operations of his company. That the shortage of crop was due to no other apparent cause than the shortage of water, as is evidenced by the fact that the crops on the heads of the canals, where it was possible to obtain a sufficient supply of water and before any great loss had occurred by evaporation and seepage, were normally good, while the crops on the lower end of the same canals, were, in some instances, particularly in the year 1915, a total failure.

W. L. MILLER.

Subscribed and sworn to before me, a notary public, residing at St. Anthony, Idaho, this 29th day of October, 1919.

[SEAL]

NORA E. CARROLL.

[H. R. 12466 (Report No. 767), Sixty-sixth Congress, second session.]

A bill authorizing the granting of certain irrigation easements in the Yellowstone National Park, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby granted to any canal or ditch company, association, corporation, or district formed for the purposes of irrigation, and duly organized under the laws of any State or Territory, and formed for mutual benefit and not for profit, such necessary rights of way, within the Falls River Basin, in the extreme southeastern southwestern portion of the Yellowstone National Park, in the States of Idaho and Wyoming, for water irrigation plants, dams, reservoirs, canals, ditches, pipes, and pipe lines, or other water conduits used to promote irrigation, as, in the judgment of the Secretary of the Interior, may be required for the purposes of this Act and may be granted without detriment to or interference with the occupation and use by the United States of the land for park purposes: Provided, That all expenses incurred by the United States in connection with such grant, or in the administration of this Act shall be borne by the grantee.

SEC. 2. That the Secretary of the Interior may also grant a right of way and designate the location for a road from the park boundary to the site of any dam or reservoir which may be granted under the provisions of this act, upon condition that the grantee, at its own cost and expense, shall construct and perpetually maintain said road and any bridges constructed in connection therewith in good repair, and the grantee may also construct and maintain, subject to the approval of the Secretary of the Interior, telephone and telegraph lines necessary for the operation of its business, upon condition that said lines telephone and telegraph lines, and said roads and bridges, may be freely used by officials of the Government and by the public, and that the grantee shall permit officials of the Government, for official business only, the free use of any telephone or telegraph lines that it may construct and maintain within said park or on the public lands, together with the right to connect with any such telephone and telegraph lines, private telephone lines for the exclusive use of said Government officials.

SEC. 3. That all reservoirs, dams, conduits, roads, bridges, telephone and telegraph lines, and other works constructed or maintained by the grantee not of a temporary character shall be slightly and of suitable exterior design and finish so as to harmonize with the surrounding landscape and the use of the land as a park.

SEC. 4. That all timber within the limits of any reservoir, canal, ditch, road, or other works constructed by the grantee shall be cut and removed under supervision of the Secretary of the Interior and paid for by grantee in such amounts as shall be determined to be just and equitable by said Secretary: Provided, That no other timber or other things or objects in said park outside of such rights of way shall be cut, removed, destroyed, or damaged by said grantee.

SEC. 5. That all plans and specifications for the construction, operation, and maintenance of any works, roads, structures, or lines authorized by this act shall be submitted to and approved by the Secretary of the Interior before construction, and the Secretary of the Interior is hereby further authorized and directed to make and enforce all rules and regulations necessary to carry into force and effect the purposes of this act, and to protect and preserve, in so far as consistent herewith, the beauty and purposes of said park: *Provided, That if the grantee fails or refuses to commence the construction of such works within a reasonable time after its application has been approved or to prosecute such work with due diligence thereafter or to comply with the provisions of this Act or any of the rules or regulations authorized herein, then all its rights shall be forfeited and shall revert to the United States.*

LEGAL DECISIONS.

DEPARTMENTAL DECISION OF JUNE 29, 1920, IN REFERENCE TO THE CAMERON MINING LOCATIONS IN GRAND CANYON NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
Washington, D. C., June 29, 1920.

Ex parte Ralph H. Cameron et al. Contest No. 3200. Mining locations declared null and void and motion to reopen case for further testimony denied. Affirmed.

APPEAL FROM THE GENERAL LAND OFFICE.

This is an appeal by Ralph H. Cameron and the United States Platinum Co. from the decision of the Commissioner of the General Land Office of May 12, 1919, denying their motion to reopen the hearing had on the protest of the Forest Service against the Apache, Cheyenne, Dakotah, and Bannock placer mining claims, and the Banjo lode mining claim, situated approximately in what, if surveyed, would be T. 31 N., Rs. 2 and 3 E., G. and S. R. B. and M., Phoenix, Ariz., land district, and declaring said claims to be null and void.

The claims purport to have been located in 1906 and 1907 and are within the limits of the Grand Canyon (now Tusayan) National Forest, created by the proclamation of February 20, 1893 (27 Stat., 1064), pursuant to section 24 of the act of March 3, 1891 (26 Stat., 1095, 1103), and within the area which, by Executive proclamation of January 11, 1908 (35 Stat., 2175), was "subject to all prior valid adverse claims," reserved from appropriation and use of all kinds, and set apart as the Grand Canyon National Monument, pursuant to the act of June 8, 1906 (34 Stat., 225). They are now within the tract which, by the act of February 26, 1919 (40 Stat., 1175), was reserved and withdrawn from settlement, occupancy, and disposition under the land laws of the United States and dedicated and set apart as the Grand Canyon National Park, subject, however, to the provision that nothing contained in the act shall affect any valid existing claim, location, or entry under the land laws of the United States. By section 9 of said act the Executive order of January 11, 1908, creating the Grand Canyon National Monument, was revoked and repealed.

In March and April, 1913, the commissioner directed the institution of six separate proceedings, involving 17 lode and placer mining claims situated in said national forest and national monument, two of said proceedings involving the five claims hereinabove named, on charges made by an officer of the Forest Service to the effect (1) that the land included in each of said claims is non-mineral in character; (2) that no valid discovery of mineral has been made within the limits thereof; (3) that the claim is not being held in good faith for mining purposes.

Denial of said charges having been filed in each of the proceedings, hearings were set thereon for October 7, 1913; but after two continuances to specific dates said hearings were indefinitely continued. By letter of March 5, 1915, however, the commissioner instructed the local officers to proceed with the hearings, and on June 18, 1915, the same were set for August 10, 1915. Prior to the date last mentioned a plea to the jurisdiction of the Land Department was interposed in each of the cases, on the ground that the claims involved were merely locations for which no application for patent had been filed. Said

pleas, however, were overruled by the local officers, and the cases, which on stipulation were consolidated, were continued to August 12, 1915, pending decision in a suit then recently instituted by Cameron in the United States district court in and for the district of Arizona, to enjoin the local officers from proceeding in the matter. Upon a stipulation that the Government might introduce its testimony, but that the protestees should not be required to introduce their evidence until after the expiration of a reasonable time following decision in the injunction proceedings, the Government introduced its evidence and the case was continued to November 19, 1915.

November 8, 1915, the court dismissed Cameron's bill for injunction, and on the date last set the hearing was resumed. The protestees then moved for a further continuance on the ground that the injunction proceedings were then still pending, it being alleged that Cameron was prosecuting an appeal therein to the Supreme Court of the United States, but the motion was overruled.

The attorney for the protestees then announced that they would submit no evidence at that time, whereupon the local officers declared the taking of testimony closed.

No appeal was prosecuted by Cameron from the judgment of the United States District Court, but on December 8, 1915, he filed in the Supreme Court of the District of Columbia a bill to enjoin the Secretary and the commissioner from proceeding in the case. Thereupon, by letter of December 10, 1915, the department directed that the status quo existing at the time of the filing of the suit last mentioned be preserved until otherwise ordered, and by letter of December 13, 1915, the commissioner directed the local officers to suspend action. April 5, 1916, the Supreme Court of the District of Columbia sustained Cameron's bill and granted the injunction prayed for, but on appeal the same was reversed November 14, 1916, by the Court of Appeals of the District of Columbia and the case remanded with directions to dismiss the bill. (See *Lane v. Cameron*, 45 App. D. C., 404; 46 L. D., 195.) The decision last mentioned became final, no appeal therefrom having been taken by Cameron, and by letters of February 11 and April 11, 1918, the commissioner directed the local officers to proceed with the case. May 25, 1918, the local officers found and held that the charges against the locations had been sustained and recommended that the necessary procedure to secure the cancellation of the locations and restoration of the land to the national monument be taken.

From this action of the local officers the protestees appealed and at the same time filed a motion praying that the proceedings be reopened and that they be afforded an opportunity to submit evidence in their own behalf. It was asserted in said motion that the claims involved in the protest proceedings contained large quantities of valuable mineral, particularly platinum; that numerous samples taken from the claims showed from assay thereof the presence of platinum in commercial quantities; that the claims had been carefully examined by mining engineers who would testify, if afforded an opportunity, that said claims are mineral in character and susceptible of producing enormous amounts of platinum, and that sufficient discoveries to support the respective locations had been made within the limits thereof.

By the decision here appealed from the commissioner held the showing to be insufficient to warrant a reopening of the case, affirmed the action of the local officers, and adjudged the locations to be null and void and of no effect.

The appeal challenges the correctness of the commissioner's decision in affirming the action of the local officers of November 19, 1915, overruling the protestees' motion for a continuance and declaring the case closed, and deciding it upon the removal of the suspension by the commissioner's letter of February 11, 1918, without affording the protestees further opportunity to introduce evidence in their own behalf. The department finds no substantial merit in this position. The protestees had had their day in court, and, instead of availing themselves thereof and introducing evidence, elected to rely upon the outcome of the suits brought by Cameron to test the jurisdiction of the land department to hear and determine the issue raised respecting the claims, in which suits Cameron was unsuccessful. Nor, as contended to the contrary in the appeal, did either of the said suits in anywise affect the action of the local officers in denying the continuance sought and closing the hearing, for the reason that a judgment adverse to Cameron had been entered in the suit brought by him in the United States district court at the time said action of the local officers was taken, and no appeal from that judgment was prosecuted; while the suit brought by Cameron in the Supreme Court of the District of Columbia, which was also decided adversely to Cameron, was not com-

menced until after the motion for continuance had been denied and the hearing closed. While it is true, as urged in the appeal, that the protestees were entitled to have the action of the local officers denying the continuance reviewed by the commissioner, their right to raise the question as to the propriety of said action did not accrue until after the local officers had decided the case on the merits. It was then raised by the protestees, was reviewed by the commissioner, and the action of the local officers sustained. It is also contended that the commissioner's letter of December 13, 1915, directing suspension of action on the case by the local officers in effect granted the continuance sought. That contention is unsound, as the only purpose of the commissioner's order of suspension was to give effect to the departmental order of December 10, 1915, directing that the case remain in status quo until further instructions; it was not intended to and did not reverse or otherwise affect any action that had been theretofore taken by the local officers.

The remaining questions presented in the appeal relate to the commissioner's action in denying the protestees' motion to reopen the hearing.

In support of said motion there was filed an affidavit by Cameron, sworn to March 25, 1919, wherein he avers that until he transferred the claims here in question to one Russel Thayer, who in turn conveyed the same to the United States Platinum Co., affiant was the owner of the claims; that the holdings of the affiant and the United States Platinum Co., as transferee, include several other claims contiguous to those here in question; that in 1917 and 1918 numerous samples from the whole group of claims were taken and assayed, but that the affiant is unable to specify the particular claims or the particular points therein from which said samples were taken; that in 1917 five samples were taken from the dumps on the said group of claims and shipped to the J. Bishop & Co. Platinum Works, at Malvern, Pa., and that assay returns therefrom showed a minimum of 1.75 ounces and a maximum of 2.83 ounces of platinum per ton; that in 1917 one J. M. Boutwell, a mining engineer, took samples from said properties, and that the same were assayed by the said platinum works and showed that six averaged 0.344 ounce of platinum per ton, two averaged 0.400 ounce, seven averaged 1.452 ounces; that the highest assay return gave 2.004 ounces; that in the fall of 1917 one P. Overfield, a mining man, took three samples from the property, which were assayed by the platinum works and showed results of, respectively, 0.20, 0.26, and 0.24 ounce of platinum per ton; that early in 1918 A. C. Simkins took samples upon the property, which, upon assay by said platinum works, showed returns as high as 0.90 ounce of platinum per ton; that in the summer and fall of 1918 the affiant engaged said J. M. Boutwell to make an examination of said properties and to report thereon; that Boutwell spent two weeks there at one time and later, in company with the affiant, was there five weeks and took in the neighborhood 400 samples, which were assayed by the platinum works, and some by Smith, Emery & Co., of San Francisco, and by Von Schulz & Low, of Denver; that the United States Platinum Co. paid Boutwell for his time and work, including the making of an exhaustive reports on the properties, with detailed geological maps, assays, etc., but that affiant and the company have received from him only the duplicate copies of assay returns; that, unless the said detailed report by Boutwell shall be received, the company and affiant will be unable to specify the claims, or the points within the claims, from which said samples were taken, thus rendering it necessary for the company or affiant to practically duplicate the work of Boutwell in order to make a showing as to the value of the deposits on the claims.

There is also submitted the affidavit of Charles H. Kerk, the secretary and treasurer of the said J. Bishop & Co. Platinum Works, sworn to March 27, 1919, who avers that several years before he spent three days on the claims above named and observed the deposits from which the platinum returns were obtained; that he himself took samples from said deposits, which upon assay by the company showed good returns in platinum; that from his personal knowledge of the deposits and of the samples taken by himself, as well as those assayed by the company, the deposits are shown to vary in platinum content; that there is a richer concentration in some portions that will have to be located and developed as a preliminary to commercial operations; that the commercial value depends entirely on the method of separation; that in the Urals (Russia), California, Oregon, and Columbia the platinum is obtained by gravity concentration; that the platinum in the deposits in question, however, is very finely divided and will not permit of gravity separation and has to be recovered by other methods; that his company has been working on processes for recovering platinum from

the deposits in question, and that he believes that it has developed a commercial process for handling said deposits; that he believes that material showing an assay return of 0.20 ounce of platinum per ton can be handled commercially at a profit; that in his judgment the properties from which the samples assayed by his company were taken contain platinum in commercial quantities; and that the same can be worked on the ground by the process developed by his concern.

With said affidavits there were submitted by the protestees, certificates of assay by the J. Bishop & Co. Platinum Works of about 294 separate samples of material (of which from two to seven assays each appear to have been made), alleged to have been taken by the said J. M. Boutwell and A. C. Simkins and P. Overfield from certain points, not identified, within the five claims here in question and adjoining claims, but none of which samples was identified as coming from any particular one of the said claims. From said certificates it appears that only 12 of the samples were shown by the assays to carry as much as 0.20 ounce of platinum per ton, the minimum believed by affiant Kerk, but, so far as alleged, not demonstrated, to be susceptible of commercial development; 5 from 0.16 to 0.19 ounce; 21 from 0.11 to 0.15 ounce; 63 from 0.05 to 0.10 ounce; the remaining 193 samples being returned as carrying only a trace, or as "blank." The protestees also filed certificates of assay by Smith, Emery & Co., of San Francisco, representing parts of nearly all of the samples above mentioned, of which but 12 were returned as containing definitely determinable quantities of platinum per ton, and those of from only 0.005 to 0.027 ounce, the returns as to the remainder being either a trace or "nil"; and certificates of assay by Von Schulz & Low, of Denver, of 36 of said samples, but 1 of which was returned as carrying as much as a trace of platinum, and that, of only 0.17 ounce per ton.

Attached to the appeal from the commissioner's decision is a report, sworn to by one R. E. Hickman, to the effect that during the course of certain work performed mainly by him, or under his supervision, in the summer of 1912, at points along the Bright Angel Trail, and near the Indian Gardens, in the Grand Canyon, 92 samples were taken; that assays of said samples showed that 1 carried 0.26 ounce of platinum per ton; 1, 0.18 ounce; 17 from 0.02 to 0.08 ounce; 27 a trace; and the remainder none.

It appears from the assay certificates filed that the group of six, two, and seven samples alleged in the affidavit of Cameron to have shown average assay values of, respectively, 0.344, 0.400, and 1.452 ounces per ton in platinum, were, in fact, six, two, and seven parts, respectively, of each of three samples.

In *Ralph H. Cameron et al. v. The United States* (— U. S., —), involving the Golden Horn lode mining claim, situated within said former Grand Canyon National Monument, and which, like the claims here in question, was alleged to have been located before the creation of the national monument, it is said:

* * * To make the claim valid, or to invest the locator with a right to the possession, it was essential that the land be mineral in character and that there be an adequate mineral discovery within the limits of the claim as located. (Rev. Stat., sec. 2320; *Cole v. Ralph*, — U. S., —); and to bring the claim within the saving clause in the withdrawal for the monument reserve the discovery must have preceded the creation of that reserve.

The evidence adduced on behalf of the Government in the present proceeding was to the effect that neither platinum nor mineral of any kind had been, at the date of the hearing, discovered within the limits of any of the claims in question, and that none of said claims has any value for mining purposes. It is clear, therefore, that, under the rule stated in the decision above cited, to overcome the showing made on behalf of the Government and to establish the present validity of said claims, or any of them, it must be shown, not only that the land included therein possesses a positive value for mining purposes, but that a mineral discovery therein sufficient to support a location had been made prior to the date of the proclamation creating the national monument reserve. Conceding that all the facts, as distinguished from mere conclusions, set forth in the affidavits filed in support of the protestees' motion, and indicated by the assay certificates above mentioned, could be substantiated by evidence adduced at a further hearing, should one be ordered for that purpose, such facts would, in the opinion of the department, fall far short of establishing the existence upon any of said claims of an adequate discovery of mineral at the date of the creation of the national monument reserve, or the present mineral character of the land. For this reason the showing presented must be held to be insufficient to warrant a reopening of the case for further hearing, and the judgment of the commissioner is accordingly affirmed.

(Signed)

S. G. HOPKINS,
Assistant Secretary.

PROMULGATION OF DEPARTMENTAL DECISION OF JUNE 29, 1920, BY COMMISSIONER
OF THE GENERAL LAND OFFICE.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., September 22, 1920.

United States *v.* Ralph H. Cameron et al. Involving charges against mining claims in the Grand Canyon National Park. Decision promulgated. Case closed.

REGISTER AND RECEIVER,
Phoenix, Ariz.

SIRS: In reference to the above entitled case, you are advised that the decision of the Secretary of the Interior dated June 29, 1920, has become final, motion for rehearing having been denied September 15, 1920. Copies of said decision are inclosed for your information and for your files.

The case is hereby closed. So note your records.

The alleged mining locations, to wit, Banjo, Millionaire, Sentinel Treasure, Peg Leg, Hill Top, Sunflower, Limestone Goldenola, Ida May, and Buttinsky lode claims, Cheyenne, Dakotah, Bannock, Apache, Folly, Hermit, and Gorge placer claims, are declared null and void, and the land will be administered as a part of the national park without regard to the so-called locations.

Very respectfully,

CLAY TALLMAN, *Commissioner.*

APPENDIX E.

NATIONAL PARK PUBLICATIONS.

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Publications sold by Superintendent of Documents.....	895
Topographic maps sold by United States Geological Survey.....	897
Railroad Guide Books sold by Superintendent of Documents.....	899
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NATIONAL PARK PUBLICATIONS.

[Mailed free of charge upon application to the Director of the National Park Service, Washington, D. C.]

Annual Report of the National Park Service for the year 1920. Stephen T. Mather, director.

Contains summary of the operations and development of the national parks for current year, reports of park superintendents, national park and monument statistics, etc. Illustrated.

Annual Report of the National Park Service for the year 1919. Stephen T. Mather, director.

Annual Report of the National Park Service for the year 1918. Stephen T. Mather, director. (Edition exhausted.)

Annual Report of the National Park Service for the year 1917. Horace M. Albright, acting director. (Edition exhausted.)

Progress in the Development of the National Parks. By Stephen T. Mather, Director of the National Park Service. 1916. 39 pages.

Report on the Proposed Sand Dunes National Park, Indiana. By Stephen T. Mather, Director of the National Park Service. 1917. 113 pages. (Edition exhausted.)

Contains description and maps of the sand dunes, the history of the project, and the hearings held in Chicago October 30, 1916.

Early History of Glacier National Park, Montana. By Madison Grant. 1919. 12 pages.

Early History of Yosemite Valley, California. By Ralph S. Kuykendall. 1919. 12 pages.

Rules and Regulations containing data regarding hotels, camps, points of interest, bibliography, maps, etc., about each of the following national parks:

Yellowstone.	Mesa Verde.	Glacier.
Yosemite.	Sequoia and	Rocky Mountain.
Mount Rainier.	General Grant.	Wind Cave.
Crater Lake.	Hot Springs Reservation.	Grand Canyon.

Information circulars relating to national monuments:

General information regarding Casa Grande National Monument, Arizona.

Map showing all national parks and national monuments, administered by the National Park Service, with railroad connections.

Automobile road and trail map of each of the following national parks:

Yellowstone.	Sequoia and	Glacier.
Yosemite.	General Grant.	Rocky Mountain.
Mount Rainier.	Crater Lake.	

The following-named publications relating to Lafayette National Park (formerly Sieur de Monts National Monument):

Announcement by the Government of the creation of the Sieur de Monts National Monument by Presidential Proclamation on July 8, 1916.

Addresses at meeting held at Bar Harbor on August 22, 1916, to commemorate the establishment of the Sieur de Monts National Monument.

The Sieur de Monts National Monument as a Bird Sanctuary.

The Coastal Setting, Rocks and Woods of the Sieur de Monts National Monument.

An Acadian Plant Sanctuary.

Wild Life and Nature Conservation in the Eastern States.

Man and Nature. Our Duty to the Future.

The Acadian Forest.

The Sieur de Monts National Monument as commemorating Acadia and early French influences of Race and Settlement in the United States.

Purchase translation of de Monts' Commission. De Monts: an Appreciation. Natural Bird Gardens on Mount Desert Island.

The Sieur de Monts National Monument and its Historical Associations.

Garden Approaches to the National Monument. The White Mountain National Forest. Crawford Notch in 1797.

Two National Monuments—The Desert and the Ocean Front. (Mount Desert, Maine; and Zion Canyon, Utah.)

SOLD BY THE SUPERINTENDENT OF DOCUMENTS.

(Remittances for publications listed below should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., by money order or in cash. Checks and postage stamps can not be accepted.)

PAMPHLETS.

General.

National Parks Portfolio. By Robert Sterling Yard. 1917. 260 pages, including 270 illustrations. Pamphlet edition, loose in flexible cover, 35 cents; book edition, containing same material securely bound in cloth, 55 cents.

Contains nine sections, each descriptive of a national park and one larger section devoted to other national parks and monuments.

Proceedings of the [First] National Park Conference Held at Yellowstone National Park, September 11 and 12, 1911. 210 pages. 15 cents.

Contains a discussion of national-park problems by officers of the Government and other persons.

Proceedings of the [Second] National Park Conference Held at Yosemite National Park, October 14, 15, and 16, 1912. 146 pages. 15 cents.

Consists mainly of a discussion regarding the advisability of admitting automobiles to the national parks.

Proceedings of the [Third] National Park Conference Held at Berkeley, Calif., March 11, 12, and 13, 1915. 1915. 166 pages. 20 cents.

Contains discussions of national-park problems by officers of the Government and others.

Proceedings of the [Fourth] National Park Conference Held at Washington, D. C., January 2 to 6, 1917. 362 pages. 25 cents.

Contains discussions of national-park problems by officers of the Government and others.

Crater Lake National Park.

Geological History of Crater Lake. By J. S. Diller. 1912. 32 pages, including 28 illustrations. 10 cents.

Contains an account of the formation of Crater Lake.

Forests of Crater Lake National Park. By J. F. Pernot. 1916. 40 pages, including 26 illustrations. 20 cents.

Contains descriptions of the forest cover and of the principal species.

Glacier National Park.

Origin of the Scenic Features of Glacier National Park. By M. R. Campbell. 1914. 42 pages, including 25 illustrations. 15 cents.

Contains a general account of the forces that have caused the development of the mountain ranges, the valleys, and lakes of Glacier National Park.

Glaciers of Glacier National Park. By W. C. Alden. 1914. 48 pages, including 30 illustrations. 15 cents.

Contains descriptions of the principal features of the larger glaciers in the park.

Some Lakes of Glacier National Park. By M. J. Elrod. 1912. 32 pages, including 19 illustrations. 10 cents.

Contains a description of some of the principal lakes, with special reference to the possibility of stocking the lakes with fish.

Glacier National Park—A Popular Guide to Its Geology and Scenery. By M. R. Campbell. (Bulletin 600, U. S. Geological Survey.) 1914. 54 pages, 13 plates, including map. 30 cents.

Wild Animals of Glacier National Park; The Mammals, by Vernon Bailey; The Birds, by Florence Merriam Bailey; 1919. 210 pages, 94 text figures, 37 plates, including map. 50 cents.

Describes the birds and animals both popularly and scientifically; tells how the visitor may identify them.

Hot Springs Reservation.

Analyses of the Waters of the Hot Springs of Arkansas, by J. K. Haywood, and Geological Sketch of Hot Springs, Ark., by Walter Harvey Webb. 56 pages. 10 cents.

Lassen Volcanic National Park.

The Volcanic History of Lassen Peak. By J. S. Diller. 1918. 14 pages, 10 illustrations. 5 cents.

Contains a detailed account of the geologic and scenic features of Lassen Volcanic National Park.

Mesa Verde National Park.

Antiquities of the Mesa Verde National Park: Spruce Tree House.¹ By J. W. Fewkes. (Bull. 41, Bureau of American Ethnology.) 1909. 58 pages, 21 plates, 37 text figures. 40 cents.

Contains a detailed account of the structure and of the objects found in it.

Antiquities of Mesa Verde National Park: Cliff Palace.¹ By J. W. Fewkes. (Bull. 51, Bureau of American Ethnology.) 1911. 82 pages, 35 plates, 4 text figures. 45 cents.

Contains a detailed account of the structure and of the objects found in it.

Excavation and Repair of Sun Temple. By J. W. Fewkes. 1916. 82 pages, including 18 illustrations. 15 cents.

Contains an account of a new ruin discovered in 1915.

Mount Rainier National Park.

Features of the Flora of Mount Rainier National Park. By J. B. Flett. 1916. 48 pages, including 40 illustrations. 25 cents.

Contains descriptions of the flowering trees, shrubs, and plants in the park.

Forests of Mount Rainier National Park. By G. F. Allen. 1916. 32 pages, including 27 illustrations. 20 cents.

Contains descriptions of the forest cover and of the principal species.

Mount Rainier and Its Glaciers. By F. E. Matthes. 1914. 48 pages, including 26 illustrations. 15 cents.

Contains a general account of the glaciers of Mount Rainier and of the development of the valleys and basins surrounding the peak.

Rocky Mountain National Park.

Geologic Story of Rocky Mountain National Park. By Willis T. Lee, Ph. D. 1917. 89 pages, 45 plates, 6 text figures. 30 cents.

Contains a detailed description of the park and its various geologic and scenic features.

Mountaineering in the Rocky Mountain National Park. By Roger W. Toll. 1919. 106 pages, including 48 illustrations and 2 maps. 25 cents.

Contains directions for climbing principal mountains of the Rocky Mountain Park region. For beginners as well as experienced mountaineers.

Sequoia and General Grant National Parks.

See Yosemite.

Yellowstone National Park.

Geological History of Yellowstone National Park. By Arnold Hague. 1920. 24 pages, including 10 illustrations. 10 cents.

Contains a general résumé of the geologic forces that have been active in the Yellowstone National Park.

¹ Out of print.

Geysers. By Walter Harvey Weed. 1912. 32 pages, including 23 illustrations. 10 cents.

In this pamphlet is a description of the forces which have produced the geysers.

Fossil Forests of Yellowstone National Park. By F. H. Knowlton. 1914. 32 pages, including 15 illustrations. 10 cents.

Contains descriptions of the fossil forests of the Yellowstone National Park and an account of their origin.

Fishes of the Yellowstone National Park. By W. C. Kendall. (Bureau of Fisheries Document 818.) 1915. 28 pages, including 17 illustrations. 5 cents.

Contains descriptions of the species and lists of streams where found.

Yosemite National Park.

Forests of Yosemite, Sequoia, and General Grant National Parks. By C. L. Hill. 1920. 40 pages, including 23 illustrations. 20 cents.

Contains description of the forest cover and of the principal species.

The Secret of the Big Trees—Yosemite, Sequoia, and General Grant National Parks. By Ellsworth Huntington. 1913. 24 pages, including 14 illustrations. 5 cents.

Contains an account of the climatic changes that are indicated by the thickness of the growth rings in the big trees, and gives a comparative statement of the climatic conditions in California and Asia during a period of 3,400 years.

Sketch of Yosemite National Park and An Account of the Origin of Yosemite and Hetch Hetchy Valleys. By F. E. Matthes. 1920. 48 pages, including 24 illustrations. 10 cents.

Contains a description of the general features of the Sierra Nevada and the Yosemite National Park and an account of the origin of the Yosemite and Hetch Hetchy Valleys.

PANORAMIC VIEWS.

(The panoramic views listed below are based on accurate surveys and give an excellent idea of the configuration of the surface as it would appear to a person flying over it. The meadows and valleys are printed in light green, the streams and lakes in light blue, the cliffs and ridges in combinations of color, and the roads in light brown. The lettering is printed in light brown and is easily read on close inspection, but merges into the other colors when the sheet is held at some distance.)

Panoramic view of Crater Lake National Park. 16½ x 18 inches, scale 1 mile to the inch. 25 cents.

Panoramic view of Yosemite National Park. 18½ x 18 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Glacier National Park. 18½ x 21 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Mount Rainier National Park. 20 x 19 inches, scale 1 mile to the inch. 25 cents.

Panoramic view of Yellowstone National Park. 18 x 21 inches, scale 3 miles to the inch. 25 cents.

Panoramic view of Mesa Verde National Park. 22½ by 19 inches, scale three-fourths mile to the inch. 25 cents.

Panoramic view of Rocky Mountain National Park. 14 by 17½ inches, scale 2 miles to the inch. 25 cents.

TOPOGRAPHIC MAPS SOLD BY THE U. S. GEOLOGICAL SURVEY.

(The maps listed below may be purchased from the Director of the United States Geological Survey, Washington, D. C. Remittances should be made by money order or in cash. Personal checks can not be accepted. A discount of 40 per cent is allowed on all orders for maps amounting to \$3 net or more.)

National Parks.

Crater Lake National Park, Oreg. Limiting parallels, 42° 48' and 43° 04'. Limiting meridians, 122° and 122° 18'. Size, 19 by 22 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 50 feet. An illustrated description of the lake and the manner of its formation is given on the back of the sheet. Price, 10 cents.

General Grant National Park, Cal. Shown on the Tehipite map. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Glacier National Park, Mont. Limiting parallels, 48° 14' 36" and 49°. Limiting meridians, 113° 10' and 114° 30'. Size, 31 by 35 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents.

Grand Canyon National Park, Ariz. Large portion shown on Shinumo, Bright Angel, and Vishnu maps. Scale, 1:48,000, or about 1 mile to 1½ inches. Contour interval, 50 feet. The geologic history of the area covered by the Bright Angel map is given on the back of that sheet. Price of each map, 20 cents.

Hot Springs Reservation, Ark. Shown on the map of Hot Springs and vicinity. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 20 feet. Price, 10 cents.

Lafayette National Park, Me. Shown on Bar Harbor and Mount Desert maps. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 20 feet. Price of each map, 10 cents.

Mesa Verde National Park, Colo. Limiting parallels, 37° 09' 18" and 37° 21'. Limiting meridians, 108° 15' and 108° 37' 30". Size, 31 by 46 inches. Scale, 1:31,250, or about one-half mile to 1 inch. Contour interval, 25 feet. Price, 20 cents.

Mount Rainier National Park, Wash. Limiting parallels, 46° 43' 43" and 47° 00'. Limiting meridians, 121° 30' and 121° 55'. Size, 22 by 23 inches. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Platt National Park, Okla. This park is at the town of Sulphur, Murray County, which is shown on the Stonewall map. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Rocky Mountain National Park, Colo. Limiting parallels, 40° 00' and approximately 40° 33' 15". Limiting meridians, 106° 30' and 106° 00'. Size, 17 by 22 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 10 cents.

Sequoia National Park, Calif. Shown on the Kaweah and Tehipite maps. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price of each map, 10 cents.

Wind Cave National Park, S. Dak. Shown on the Harney Peak and Hermosa maps. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price of each map, 10 cents.

Yellowstone National Park, Wyo.-Mont.-Idaho. Limiting parallels, 44° 08' 17" and 45° 01' 55". Limiting meridians, 110° and 111° 05' 53". Size, 32 by 36 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents.

Yosemite National Park, Calif. The park limits established by acts of Congress are shown in colors. Limiting parallels, 37° 30' and 38° 15' 39". Limiting meridians, 119° and 120°. Size, 29 by 31 inches. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 100 feet. Price, 25 cents. Also issued folded between covers; price, 40 cents. The Yosemite Valley is shown on a larger scale on the Yosemite Valley map.

Yosemite Valley, Calif. Shown on the Yosemite Valley map. Limiting parallels, 37° 42' and 37° 47' 05". Limiting meridians, 119° 30' and 119° 43' 40". Scale, 1:24,000, or about 1 mile to 2½ inches. Contour interval, 50 feet. Price, 10 cents.

National monuments.

Casa Grande National Monument, Ariz. The northern part of this area is shown on the Sacaton map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Devils Tower National Monument, Wyo. Shown on Devils Tower map. Scale, 1:125,000, or about 2 miles to 1 inch. Contour interval, 50 feet. Price, 10 cents.

Muir Woods National Monument, Calif. Shown on Tamalpais map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 25 feet. Price, 10 cents.

Petrified Forest National Monument, Ariz. Shown on Petrified Forest map. Scale, 1:62,500, or about 1 mile to 1 inch. Contour interval, 25 feet. Price, 10 cents.

RAILROAD GUIDEBOOKS.

(Sold by Superintendent of Documents. Remittances for publications listed below should be made to the Superintendent of Documents, Government Printing Office, Washington, D. C., by money order or in cash. Checks and postage stamps can not be accepted.)

In the Geological Survey bulletins listed below are described the geography, geology, history, and natural resources of the regions traversed by the principal transcontinental routes. Every effort has been made to make the volumes interesting as well as accurate. Matter slightly more detailed or technical than that in the body of the text has been separated as footnotes, and a glossary has been provided for such geologic terms as it was necessary to use. The more important sources of geologic information on the region are listed in the back, and a table showing the principal divisions of geologic time appears on the backs of the title pages.

Guidebook of the Western United States, Part A, the Northern Pacific Route, with a side trip to Yellowstone Park, by M. R. Campbell and others. (Bulletin 611, U. S. Geological Survey.) 1915. 212 pages, 27 route maps, 27 plates, 39 text figures. 50 cents.

This volume deals with the country along the Northern Pacific Railroad from St. Paul to Seattle and along the branch line to Yellowstone Park. It is the purpose of this volume to answer some of the questions which these views from the car windows evoke, to tell what the rocks are and how they got there, to explain the effects of earth movements upon them, to show how that conspicuous element in scenery which we call topography is the result of a long succession of geologic events—in brief, to tell the story of mountains, valleys, and plains. It does not stop there, however. It connects this record of the prehistoric past with the present march of western progress and development by showing the relation of geologic processes to natural resources of various kinds; it describes the utilization of these resources and tells how man has turned them to account.

Guidebook of the Western United States, Part B, the Overland Route, with a side trip to Yellowstone Park, by W. T. Lee, R. W. Stone, H. S. Gale, and others. (Bulletin 612, U. S. Geological Survey.) 1915. 244 pages, 29 route maps, 50 plates, 20 text figures. 50 cents.

A handbook for the traveler which deals not only with the geology but with the natural resources, history, and development of the country along the Union Pacific System between Omaha and San Francisco. It shows how differences in scenery and climate depend upon past geologic events and dispels the monotony of the great plains by taking the traveler back to times when these regions supported a vegetation very different from their present scanty covering and were inhabited by animals of strange forms and large size. The scenery of the mountains acquires additional interest from the explanation of the earth movements and the resulting rock structures to which fundamentally the mountain forms are due.

Guidebook of the Western United States, Part C, the Santa Fe Route, with a side trip to the Grand Canyon of the Colorado, by N. H. Darton and others. (Bulletin 613, U. S. Geological Survey.) 1915. 194 pages, 25 route maps, 42 plates, 40 text figures. 50 cents.

This guide describes the country along the Atchison, Topeka & Santa Fe Railroad from Kansas City to Los Angeles. Although the description of the rocks and their relations and the scenic features form a large proportion of the matter, nearly every page gives information as to notable historic events, industrial resources, plants, and animals. The story of the Indians, past and present, especially the characteristic Pueblo tribes, is told in some detail. Many of the facts regarding the rocks are here presented for the first time. The book contains numerous views of prominent scenic features and pictures of restoration of some of the very remarkable animals whose bones are found in the clays.

Guidebook of the Western United States, Part D, the Shasta Route and Coast Line, by J. S. Diller and others. (Bulletin 614, U. S. Geological Survey.) 1915. 142 pages, 19 route maps, 33 plates, 15 text figures. 50 cents.

A manual for the traveler between Seattle or Los Angeles and San Francisco, which describes in clear, simple language the geography, geology, history, and natural resources of the region visible from the car windows. Geology is made interesting to the reader by an avoidance of details and by the selection for treatment of the features that are likely to attract the eye. Care is taken also to point out the connection between the story of the earth and the present human activity in the region. The book is divided into two parts, one dealing with the route from Seattle to San Francisco and one with the route from Los Angeles to San Francisco.

APPENDIX F.

MISCELLANEOUS.

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ASSOCIATED MOUNTAINEERING CLUBS OF NORTH AMERICA.¹

American Alpine Club.

President, L. L. Delafield, 20 Exchange Place, New York.
Vice presidents, E. W. Brown, 116 Everit Street, New Haven, Conn.; W. F. Badé, 2616 College Avenue, Berkeley, Calif.
Secretary, W. D. Wilcox, 1526 New Hampshire Avenue, Washington, D. C.
Treasurer, B. F. Seaver, 14 Wall Street, New York.
Librarian, Le Roy Jeffers, 476 Fifth Avenue, New York.
Membership—Active, 95; honorary, 14; total, 109.
Dues—Annual, \$5; life, \$50.
Organized 1902. Annual meeting held in Philadelphia, New York, or Boston in December or January.
Publications—*Alpina Americana*, supplied by Williams & Wilkins Co., 2419 Greenmount Avenue, Baltimore, Md., at \$0.85 a copy. No. 1, J. N. LeConte, High Sierra of California, 1907; No. 2, C. E. Fay, Canadian Rocky Mountains, 1911; No. 3, A. H. Brooks, Mountain Exploration in Alaska, 1914; By-laws and register.
The club's collection of mountaineering books and photographs is deposited with that of the New York Public Library at 476 Fifth Avenue.

American Civic Association, 914 Union Trust Building, Washington, D. C.,

President, J. H. McFarland, Harrisburg, Pa.
Vice president, C. R. Woodruff, Philadelphia, Pa.
Secretary, Miss E. E. Marshall, 914 Union Trust Building, Washington, D. C.
Field secretary, A. W. Crawford, Philadelphia, Pa.
Membership—Annual, sustaining, life; total, 2,500.
Dues—Annual, \$5; sustaining, \$10; life, \$50.
Organized 1904. Annual meeting, October 13 to 15.
The purpose of the association is the cultivation of higher ideals of civic life and beauty; the promotion of city, town, and neighborhood improvement; and the preservation of great scenic wonders, such as Niagara Falls and the National Parks, from commercial exploitation.

American Forestry Association, 1410 H Street NW., Washington, D. C.

President, Charles L. Pack, 1410 H Street NW.
Secretary, Percival S. Ridsdale, 1410 H Street NW.
Treasurer, Charles F. Quincy, 1410 H Street NW.
Membership—Annual, subscribing, contributing, sustaining, life, patron. Total, 17,400.
Dues—Annual, \$1; subscribing, \$3; contributing, \$10; sustaining, \$25; life, \$100; patron, \$1,000.
Organized 1882. Annual meeting in January.
Publication—*American Forestry* (monthly), edited by Percival S. Ridsdale, \$3 a year. Free to members (except annual). Devoted to trees, parks, flowers, birds, and kindred subjects.
The association is working for the conservation and protection of the forests, trees, parks, flowers, and birds of the United States and Canada, and for a national forest policy which will insure a supply of forest products equal to national needs.

¹ Data assembled by Le Roy Jeffers, secretary, 476 Fifth Avenue, New York City.

American Game Protective Association, 2271 Woolworth Building, New York City.

President, John B. Burnham, 233 Broadway, New York.

Vice president, R. P. Holland, 233 Broadway, New York.

Secretary and treasurer, G. M. Fayles, 233 Broadway, New York.

Dues—Member, \$1 plus subscription to any one of several leading sportsmen's magazines, which carry monthly a department of wild-life conservation propaganda furnished by the association; club member (for organizations), \$5; associate member, \$25; sustaining member, \$100; life member, \$250; patron, \$1,000; founder, \$2,500.

Organized 1911. Annual Game Conference, January 24–25.

Publication—Bulletin (quarterly), edited by R. P. Holland, \$1.

The association is devoted to the conservation and propagation of wild life from the standpoint of the sportsman. By means of its Bulletin and through a department which it conducts in seven sportsmen's magazines it is educating the hunter to protect our game. It works with State conservation commissions and sportsmen's associations to secure and enforce State and Federal laws.

American Museum of Natural History, Seventy-seventh Street and Central Park West, New York City.

President, H. F. Osborn, Seventy-seventh Street and Central Park West.

Vice presidents, C. H. Dodge, J. P. Morgan.

Director, F. A. Lucas, Seventy-seventh Street and Central Park West.

Secretary, Adrian Iselin, Seventy-seventh Street and Central Park West.

Treasurer, H. P. Davison, Seventy-seventh Street and Central Park West.

Librarian, R. W. Tower, Seventy-seventh Street and Central Park West.

Membership—Annual, 3,350; associate, 843; sustaining, 117; life, 893; fellow, 48; patron, 115; associate benefactor, 23; associate founder, 10; benefactor, 5; honorary fellow, 9; total, 5,413.

Dues—Annual, \$10; associate (nonresident), \$3; sustaining, \$25; life, \$100; fellow, \$500; patron, \$1,000; associate benefactor, \$10,000; associate founder, \$25,000; benefactor, \$50,000.

Founded 1869. Annual meeting first Monday in February.

Publications.—Natural History (bimonthly), edited by Miss M. C. Dickerson, \$3 a year; scientific publications comprising memoirs, bulletin, anthropological papers, monographs; popular publications comprising handbooks, leaflets, general guide; annual report.

The library consists of about 70,000 volumes on natural history, ethnology, and travel, and is located on the fifth floor of the museum building.

The museum is an educational institution, maintaining a museum and library of natural history, encouraging the study of natural science, and furnishing popular instruction along these lines. It has sent out many important expeditions for exploration and collection of specimens.

American Scenic and Historic Preservation Society, 154 Nassau Street, New York City.

President, George F. Kunz, 401 Fifth Avenue.

Vice presidents, H. W. Sackett, H. L. Bridgman, R. P. Bolton.

Secretary, E. H. Hall, 154 Nassau Street.

Treasurer, N. T. Phillips, 51 Chambers Street.

Membership.—Annual, sustaining, life, patrons, patrons in perpetuity; total, 500.

Dues.—Annual, \$10; sustaining, \$25; life, \$100; patrons, \$1,000; patrons in perpetuity, \$5,000.

Founded 1895. Annual meeting first Tuesday after the first Monday in January.

Publication.—Annual report.

The purposes of the society are to preserve beautiful natural scenery and natural objects of an unusual educational or scientific value; to preserve his-

torical buildings or places of historic importance; to secure the improvement of cities; and to preserve original historical and archaeological documents. The society is custodian of six public properties belonging to the State of New York. It has stimulated interest and donations in favor of all these objects.

Adirondack Camp and Trail Club, Lake Placid Club, New York.

President, Godfrey Dewey, Lake Placid Club, New York.

Vice president, E. A. Woods, Frick Building, Pittsburgh, Pa.

Secretary, T. M. Longstreth, Lake Placid Club, New York.

Treasurer, F. B. Guild, Lake Placid, N. Y.

Membership.—Active, 27; associate, 11; life, 1; honorary, 1; total, 40.

Annual dues.—Active, \$10; associate, \$5; life, \$100.

Organized 1910. Annual meeting middle of August.

The club keeps open about 50 miles of trails and 7 public camps in the Adirondacks.

Alpine Club of Canada,³ Banff, Alberta, Canada.

President, J. D. Patterson, Woodstock, Ontario.

Vice presidents, C. H. Mitchell, Toronto; W. W. Foster, Victoria, British Columbia.

Director, A. O. Wheeler, Sidney, British Columbia.

Secretary treasurer, S. H. Mitchell, Sidney, British Columbia.

SECTIONS.

CALGARY.—Chairman, T. B. Moffat; secretary, L. A. Duncan, 2408 Sixteenth Street West.

EDMONTON.—Chairman, H. E. Bulyea; secretary, C. G. Wates, 202 Syndicate Block.

LONDON, ENGLAND.—Chairman, J. N. Collie; secretary, A. L. Mumm, 112 Gloucester Terrace, Hyde Park.

NEW YORK.—Chairman, B. F. Seaver; secretary, Miss C. B. Hinman, 189 Summit Avenue, Summit, N. J.

SASKATOON.—Chairman, F. S. Dunn; secretary, A. S. Sibbald, Box 321.

TORONTO.—Chairman, C. B. Sissons; secretary, R. A. Gray, 324 Markham Street.

VANCOUVER.—Chairman, A. H. Sovereign; secretary, Miss A. C. Laird, 1053 Nicola Street.

VANCOUVER ISLAND.—Chairman, R. D. McCaw; secretary, G. A. Cameron, 2024 Belmont Avenue, Victoria.

WINNIPEG.—Chairman, F. C. Bell; secretary, Miss C. M. Greenway, 3 Harrow Apartments.

Membership.—Active, 382; life, 50; graduating, 122; subscribing, 29; associate, 2; honorary, 10; total, 595.

Entrance fee and dues—Active, \$7.50; graduating, \$5.

Annual dues—Active, \$5; graduating, \$2.50; subscribing, \$2; associate, \$25.

Organized 1906. Annual meeting held in July at camp.

Publications—The Canadian Alpine Journal (annually), edited by A. O. Wheeler and S. H. Mitchell, \$1.50 a copy; constitution and list of members.

Clubhouse and library—Banff, Alberta, Canada. Open June to September. Rate, \$3 a day.

1920 camp, July 20 to 31 at Mount Assiniboine. Expense, \$3.50 a day in camp.

Appalachian Mountain Club, 1050 Tremont Building, Boston, Mass.

President, H. P. Kelsey, Hawthorne Building, Salem, Mass.

Vice presidents, A. H. Tucker, 6 Reedsdale Road, Milton, Mass.; H. J. Greene, Park Building, Worcester, Mass.

Recording secretary, W. T. May, 1050 Tremont Building, Boston.

³ Not a member of the association.

Corresponding secretary, Miss A. G. Higgins, 651 Franklin street, Melrose Highlands, Mass.

Treasurer, W. O. Witherell, 1050 Tremont Building, Boston.

Librarian, Miss A. G. Higgins, 1050 Tremont Building, Boston.

CHAPTERS.

NEW YORK.—Chairman, J. D. Merriman, 2 Rector Street, New York; secretary, Miss E. R. Peck, 34 South Tenth Street, Newark, N. J.

Outings—Saturdays and holidays.

WORCESTER.—Chairman, A. H. Inman, 21 Germain Street, Worcester, Mass.; secretary, W. M. Bassett, 35 Howard Street, Worcester, Mass.

Outings—Saturdays and holidays.

Membership—Annual, 2,308; life, 292; corresponding, 46; honorary, 22; total, 2,668.

Entrance fee and dues, \$8; annual dues, \$4; life, \$50.

Organized 1876. Annual meeting second Wednesday in January.

Publications—Appalachia (annually and occasionally semiannually) \$0.50 a copy; Bulletin (10 issues a year); Register (annually); Guide to Paths in the White Mountains and Adjacent Regions, 1920, \$2.75; Bibliography of the White Mountains, by A. H. Bent, \$1; Walks and Rides in the Country Round About Boston, by E. M. Bacon, \$1.25; various booklets and maps are also published.

Clubrooms and library—1050 Tremont Building, Boston. Clubhouse and camp on Three Mile Island, Lake Winnepesaukee, N. H., is open from July 2 to September 8; expense \$2.25 a day. Cold River camp, North Chatham, N. H., is open June 26 to September 21; expense \$3 a day. Rhododendron cottage at Fitzwilliam, N. H., is open by arrangement. Madison Spring Huts, Carter Notch Hut, and Lakes of the Clouds Hut in the White Mountains are open from July 1 to September 15; meals and lodging at \$1 each. Nine shelters in New Hampshire are also available without charge. About 250 miles of trail are maintained and the club owns 17 reservations in Massachusetts, New Hampshire, and Maine.

Outings—Saturdays, holidays, and Tuesday evenings in summer. Numerous excursions of from two days to two weeks throughout the year to eastern mountain regions. Annual snowshoe trip to New Hampshire in February.

1920 camp, August 7 to September 4 at Jefferson Notch, N. H. Expense from Boston, \$95. Two weeks, \$53. Excursion to the Carolina Mountains September 22 to October 12. Expense from Boston, \$250.

Boone and Crockett Club, 60 Wall Street, New York City.

President, G. B. Grinnell, 238 East Fifteenth Street.

Vice presidents, W. B. Devereux, Archibald Rogers, Madison Grant, Charles Sheldon, C. S. Davison.

Secretary, Kermit Roosevelt, 17 Battery Place.

Treasurer, W. R. Cross, 33 Pine Street.

Membership—Active, 100; associate, 57; total, 157.

Entrance fee and dues—Active, \$35; annual dues, \$10.

Organized 1887. Annual meeting: In January.

Publications—Yearbook; five volumes on big-game hunting. The club is an association of large-game hunters and is active in the creation and protection of national parks, forest reserves, and game refuges.

British Columbia Mountaineering Club, Vancouver, British Columbia, Canada.

President, C. J. Heaney, 1639 Comox Street.

Vice presidents, Mrs. R. Harman, Toronto; W. A. Munday, 224 Twenty-ninth Avenue east, Vancouver.

Secretary, J. H. Speer, P. O. Box 1223.

Treasurer, L. C. Ford, P. O. Box 1223.

Membership—Active, 71; graduating, 20; honorary, 4; total, 95.

Entrance fee and dues—Active, \$5; graduating, \$5; annual dues, \$2.

Organized 1907. Annual meeting third Monday in March.

Club cabin—On southwestern slope of Grouse Mountain, reached via North Vancouver ferry.

Outings—Week end and holiday climbing trips.

1920 outing, August 9 to 23 in the Garibaldi region. Expense from Vancouver for two weeks, \$30.50; one week, \$22.50.

California Alpine Club, 535 Pacific Building, San Francisco, Calif.

President, A. C. Mauerhan, 58 Divisadero Street.

Vice president, W. C. Fankhauser, 913 Flood Building.

Recording secretary, Miss Norma Holroyd, 6339 Dana Street, Oakland.

Corresponding secretary, M. F. Murphy, 36 Annie Street.

Treasurer, Myron Grotzohn, 265 Russ Building.

Membership—Active, 263.

Annual dues, \$2.

Organized 1914. Annual meeting first Sunday in April.

Clubroom at 535 Pacific Building, San Francisco.

Outings—Sunday walks; winter sports excursion in February.

1920 outing, July 10 to 25, Kings River Canyon, camping at Vidette Meadows. General Grant and Sequoia National Parks will be visited. Expense from San Francisco, \$70.

Cascadians, Yakima, Wash.

President, C. E. Rusk, Yakima.

Vice presidents, J. H. Green, Miss Carrie Grosenbaugh.

Secretary, Mrs. B. G. Vincent.

Treasurer, Miss N. E. Duncan.

Membership—Active, 133. Organized 1920.

Annual dues \$5.

Outings Saturday, Sunday, and holidays.

1920 outing, July 31 to August 15, at Boulder Cave, Natches River. Expense from Yakima, \$25; one week, \$15.

Colorado Mountain Club, Denver, Colo.

President, G. C. Barnard, 615 Seventeenth Street.

Vice President, G. H. Harvey, jr., 3120 West Twenty-third Avenue.

Secretary, Miss Katharine Bruderlin, 1276 Emerson Street.

Treasurer, W. F. Ervin, 219 Temple Court Building.

BRANCHES.

BOULDER.—President, F. E. Thompson, 3700 North Twelfth Street; secretary, Miss G. C. Curtis, 1210 Pleasant Street.

PIKES PEAK, COLORADO SPRINGS.—President, Lloyd Shaw, Mesa Avenue, Broadmoor; secretary, Miss Bernhardina Johnson, 104 North Tejon Street.

Membership—Regular, 261; qualified, 381; honorary, 4; total, 646.

Annual dues, \$3.

Organized 1912. Annual meeting third Friday in January.

Publication—Trail and Timberline (monthly), edited by G. H. Harvey, jr.

Clubroom and library at the Denver Public Library.

Outings—Saturday and Sunday walks and holiday excursions. Annual winter outing, February 19 to 22, at Fern and Odessa Lakes, Rocky Mountain National Park.

1920 outing, August 8 to 22, in the San Juan Mountains, near Needleton. Expense from Denver, about \$75.

Dominion Parks Branch, Department of the Interior, 178 Queen Street, Ottawa, Canada.

Commissioner, J. B. Harkin, 178 Queen Street.

Deputy commissioner, F. H. Williamson, 178 Queen Street.

Organized 1911. Regular staff, 167.

Administers 14 parks, 6 reserves, 22 bird sanctuaries.

Parks—In Alberta: Buffalo, Elk Island, Jasper, Rocky Mountains, Waterton Lakes. In British Columbia: Glacier, Kootenay, Revelstoke, Yoho. In New Brunswick: Fort Howe. In Nova Scotia: Fort Anne. In Ontario: Broder, Point Pelee. In St. Lawrence River: St. Lawrence Islands.

PUBLICATIONS.

Annual Report of the Commissioner.

Description of and Guide to Jasper Park, edited by E. Deville, 1917. 50 cents.

Guide to the Geology of the Canadian National Parks, by Charles Camsell, 1914.

Glaciers of the Rockies and Selkirks, by A. P. Coleman, 1914.

Nakimu Caves, Glacier Dominion Park, 1914.

Classified Guide to Fish in the Rocky Mountain Park, by S. C. Vick, 1914.

Dictionary of Altitudes in the Dominion of Canada, by James White, 1916.

Commission of Conservation, Ottawa. \$0.50.

Report of the Commission to Delimit the Boundary between Alberta and British Columbia, 1917. Surveyor General, Ottawa. Part I text and atlas, 2 v. \$1.

The Selkirk Range, by A. O. Wheeler, 2 v., 1905. Secretary, Department of the Interior, Ottawa. \$1.

Maps of mountain regions may be obtained free, or at 10 cents each, from the Topographical Surveys Branch, Department of the Interior, Ottawa.

Field and Forest Club, Boston, Mass.

President, W. E. Nutting, 100 Franklin Street, Boston, Mass.

Vice presidents, A. C. Lane, 22 Arlington Street, Cambridge, Mass.; S. R. Porter, 100 Milk Street, Boston.

Recording secretary, Miss A. B. Drowne, 299 Centre Street, Dorchester, Mass. Corresponding secretary, Miss A. P. French, 36 Tennyson Street, Somerville, Mass.

Treasurer, O. H. Kent, 79 Centre Street, Dorchester, Mass.

Membership—Active, 748.

Entrance fee and dues—\$2; annual dues, \$1; life, \$15.

Organized 1904. Annual meeting, second Monday in November.

Publications—Monthly calendar; Yearbook.

Pequit Bungalow on south shore of Pequit Lake, Canton, Mass.

Outings—Saturdays, Thursdays, and holidays; fall and winter excursions to the White Mountains.

1920 outings—July 3 to 10, at Eastville Inn, Marthas Vineyard, Mass.; expense at hotel, \$20 to \$25 a week. July 3 to 24, at Boothbay Harbor, Me.; \$13 to \$17 a week. September 11 to 25, at Deer Park Hotel, North Woodstock, N. H.; expense at hotel, \$2.50 to \$3 a day.

Forest Service, United States Department of Agriculture, 930 F Street NW., Washington, D. C.

Forester, W. B. Greeley, 930 F Street NW.

Associate Forester, E. A. Sherman, 930 F Street NW.

Organized 1905. Regular staff, 3,500.

Administers 154 National Forests, 10 National Monuments, and 3 National Game Preserves through 7 district headquarters located at Missoula, Mont.; Denver, Colo.; Albuquerque, N. Mex.; Ogden, Utah; San Francisco, Calif.; Portland, Oreg.; and Washington, D. C.

Branches of the service—Silviculture, grazing lands, research, engineering, acquisition of lands.

Publications—Annual report; bulletins and maps of many of the forests containing information for mountain travelers and campers. Specify the region desired.

Fresh-Air Club, New York City.

President, H. E. Buermeyer, Hotel St. George, Brooklyn.

Secretary, Mortimer Bishop, 88 Nassau Street, New York.

Treasurer, A. F. Ormsbee, 27 Monroe Place, Brooklyn.

Membership—Active, 75; annual dues, \$2.

Organized 1877. Annual meeting, fourth Saturday in January.

Outings—Sundays and holidays. Annual excursion to the Catskills, May 29 to 31.

Geographic Society of Chicago, Chicago, Ill.

President, H. P. Pearsons, 1816 Chicago Avenue, Evanston.

Vice presidents, Frank Hamlin, 35 North Dearborn Street; R. T. Chamberlin, University of Chicago; F. T. Andrews, 448 Berry Avenue.

Recording secretary, Mrs. B. B. Bohn, 10980 Prospect Avenue.

Domestic corresponding secretary, Mrs. L. R. Frazeur, 814 South Michigan Avenue.

Treasurer, O. M. Schantz, Room 1649, 10 South La Salle Street.

Membership—Resident, 665; nonresident, 16; life, 34; honorary, 7; total, 722.

Entrance fee and dues.—Resident, \$10; nonresident, \$6.

Annual dues.—Resident, \$5; nonresident, \$3; life, \$100.

Organized 1898. Annual meeting second Friday in May.

Publications.—Bulletin on Geographic Studies, University of Chicago Press; Yearbook.

The society holds monthly and special meetings with lectures, conducts monthly excursions and occasionally a western trip in the summer. Before long it will move into the new Field Museum Building, where it will have enlarged facilities for its lectures, library, and other activities.

Geographical Society of Philadelphia, 400 Witherspoon Building, Philadelphia, Pa.

President, Henry G. Bryant, 806 Land Title Building.

Vice Presidents, W. E. Lingelbach, 4304 Osage Avenue; Miss Laura Bell, 1428 Spruce Street.

Recording secretary, J. E. Buckenham, Chestnut Hill, Pa.

Corresponding secretary, P. J. Sartain, 2006 Walnut Street.

Treasurer, W. K. Haupt, 104 South Fourth Street.

Membership.—Active, 797; nonresident, 38; life, 51; honorary, 15; corresponding, 20; total, 921.

Active membership.—Initiation fee, \$5; annual dues, \$8; life membership, \$100; nonresident membership, annual dues, \$2.

Organized 1891. Annual meeting, first Wednesday in May.

Publication.—Bulletin of the Geographical Society of Philadelphia (quarterly), edited by H. G. Bryant, \$2 a year.

Library of travel and reference at the rooms of the society, 400 Witherspoon Building.

Outings.—Afternoon and all-day walks and excursions in the spring and autumn.

The society has for its objects the furtherance of the science of geography and the promotion of geographical studies; the interchange of experiences of travel; the recording of discoveries, and the presentation of researches by means of lectures, photographic and other exhibitions; and the promotion of geographical exploration.

Green Mountain Club (Inc.), 35 Mead Block, Rutland, Vt.

President, C. P. Cooper, 49 Evergreen Avenue, Rutland.

Vice President, L. J. Paris, 324 South Union Street, Burlington.

Secretary, G. E. Chalmers, 35 Mead Block, Rutland.

Corresponding secretary, J. P. Taylor, 139 Church Street, Burlington.

Treasurer, E. S. Marsh, Brandon.

SECTIONS.

BENNINGTON.—President, W. T. White; secretary, Miss A. R. Whipple.
 BURLINGTON.—President, E. B. Taft; secretary, Miss Helen Madden, 34 Spring Street.

Outings.—Saturday afternoon and evening.

KILLINGTON, RUTLAND.—President, G. G. Marshall; secretary, W. M. Ross.

LAKE PLEIAD, MIDDLEBURY.—President, P. C. Voter; secretary, Mrs. V. C. Harrington.

NEW YORK.—President, W. S. Monroe, 33 Portland Place, Montclair, N. J.; secretary, A. C. Tate, Stamford, Conn.

Outings.—Saturdays, Sundays, and holidays.

PROCTOR.—President, Mortimer Proctor; secretary, W. M. Fay.

Membership.—Active, 799; life, 10; total, 809.

Annual dues, \$2; New York section, \$3; life, \$25.

Organized 1910. Annual meeting second Wednesday in January. The club maintains about 200 miles of trail in Vermont, along which it has constructed numerous cabins.

Publications.—Guidebook of the Long Trail, 1920, 50 cents, from E. S. Marsh; 6 maps of Monroe section of the Long Trail, \$1.50, from H. W. Congdon, 10 West Twenty-third Street, New York.

Hawaiian Trail and Mountain Club, Pan-Pacific Building, Honolulu, Hawaii.

President, J. A. Balch.

Vice presidents, E. G. Bartlett, E. H. Brown.

Secretary-treasurer, Mrs. E. F. Leo, 244 Hotel Street.

Organized 1910.

Membership—Active, 127.

Annual dues, \$2.50.

The club constructs and maintains mountain trails, and conducts Saturday and Sunday walks and climbing excursions on the various islands.

Klallhane Club, Port Angeles, Wash.

President, E. B. Webster.

Vice president, J. F. Blanchard.

Secretary, T. H. Guptill, 224 West Fifth Street.

Treasurer, Oscar Nelson.

Membership—Active, 150; honorary, 5; total, 155.

Entrance fee and dues, \$3; annual dues, \$2.

Organized 1914. Annual meeting, third Wednesday in January.

Publication—The King of the Olympics, by E. B. Webster, \$2.

Lodge on slopes of Mount Angeles.

Outings—Saturdays and Sundays.

1920 outing, August 14 to 25, To Mount Olympus. Expense, \$25.

Mazamas, 332 Chamber of Commerce Building, Portland, Oreg.

President, E. C. Sammons, 69 East Eighteenth Street.

Vice president, G. X. Riddell, 689 Everett Street.

Recording secretary, A. B. Williams, King-Davis Apartments.

Corresponding secretary, A. F. Parker, 374 East Fifty-first Street.

Treasurer, Miss Marlon Schneider, 260 Hamilton Avenue.

Membership—Active, 510; life, 5; honorary, 7; total, 522.

Annual dues, \$3; life, \$50.

Organized 1894. Annual meeting first Monday in October.

Publication—Mazama (annually), edited by G. W. Wilder, \$0.75.

Clubrooms and library, 332 Chamber of Commerce Building.

Mazama exhibit in Oregon Building, Fifth and Oak Streets.

Outings—Saturdays, Sundays, and holidays. Annual Mount Hood outing, July 17 to 18.

1920 outing, August 1 to 15, at Austin Pass, north of Mount Baker, Washington. Expense from Portland, \$60.

Mountaineers, 18 Seattle National Bank Building, Seattle, Wash.

President, E. S. Meany, 4025 Tenth Avenue NE., Seattle.

Vice president, J. H. Weer, Miller Apartments, Tacoma.

Secretary, E. W. Allen, 402 Burke Building, Seattle.

Treasurer, C. G. Morrison, 1004 Third Avenue, Seattle.

BRANCHES.

EVERETT.—Chairman, G. D. Thompson, 2429 Baker Avenue; secretary, Miss Catherine Crayton, 3109 Colby Avenue.

Outings—Sundays and holidays.

TACOMA.—President, J. H. Weer, Miller Apartments; secretary, Miss M. H. Mudgett, 314 Tacoma Building.

Outings—Sundays and holidays.

Membership—Active, 612; life, 3; honorary, 2; total, 617.

Entrance fee and dues—Residents of Kings County, \$5; nonresidents, \$4.

Annual dues—Active, residents of Kings County, \$4; nonresidents, \$3; contributing, \$10; life, \$100.

Organized 1907. Annual meeting, third Friday in October.

Publications—The Mountaineer (annually), edited by J. T. Hazard, \$0.50; Mountaineer Bulletin (monthly).

Clubrooms and library, 18 Seattle National Bank Building.

Snoqualmie Lodge near Rockdale, on Chicago, Milwaukee & St. Paul Railroad; Kitsap Lodge in Rhododendron Park, a reservation owned by the club near Chico, Kitsap County.

Outings—Sundays and week-end trips. Annual winter outing in Mount Rainier National Park, December 28 to January 1.

1920 outing, July 31 to August 21, in the Olympics, visiting Mount Olympus. Expense from Seattle, \$75.

National Association of Audubon Societies, 1974 Broadway, New York City.

President, William Dutcher, Plainfield, N. J.

Acting president, F. A. Lucas, American Museum of Natural History, New York.

Vice president, T. S. Palmer, United States Department of Agriculture, Washington, D. C.

Secretary and executive, T. G. Pearson, 1974 Broadway, New York.

Treasurer, Jonathan Dwight, jr., 134 West Seventy-first Street, New York.

Membership—Affiliated societies, 152; annual and contributing, 4,890; life, 855; patrons, 3; total, 5,900.

Annual dues, \$5; life, \$100; patron, \$1,000; founder, \$5,000.

Incorporated 1905. Annual meeting last Tuesday in October.

Publication—Bird-Lore (bimonthly), edited by F. M. Chapman, \$1.50 a year.

The association is working to arouse the public conscience for the preservation of the wild birds and game animals of the country, and for the protection at all times of the valuable nongame birds.

National Park Service, United States Department of the Interior, Eighteenth and F Streets, Washington, D. C.

Director, S. T. Mather, Room 4141, Department of the Interior.

Assistant director, A. B. Cammerer, Room 4142, Department of the Interior.

Organized 1917. Regular staff, 225.

Administers 19 National Parks, 24 National Monuments.

National Parks—Crater Lake, Oregon; General Grant, California; Glacier, Montana; Grand Canyon, Arizona; Hawaii, Hawaiian Island; Hot Springs Reservation, Arkansas; Lafayette, Maine; Lassen Volcanic, California; Mesa Verde, Colorado; Mount McKinley, Alaska; Mount Rainier, Washington; Platt, Oklahoma; Rocky Mountain, Colorado; Sequoia, California; Sullys Hill, North Dakota; Wind Cave, South Dakota; Yellowstone, Wyoming; Yosemite, California; Zion, Utah.

National Park Conference last held in Denver, November, 1919.

A complete list of national park publications is given at page 394.

National Parks Association, 1512 H Street NW., Washington, D. C.

President, H. B. F. Macfarland, Evans Building.

Vice presidents, N. M. Butler, J. M. Clarke, William Kent, Henry Suzzallo.

Secretary, R. S. Yard, 1512 H Street NW.

Treasurer, C. J. Bell, American Security & Trust Co.

Membership—Annual, sustaining, life.

Annual dues, \$3; sustaining, \$25; life, \$500.

Organized 1919. Annual meeting third Thursday in May.

Publications—The New Grand Canyon National Park, by R. S. Yard, 1919; The New Zion National Park, by R. S. Yard, 1919.

New York Zoological Society, 111 Broadway, New York City.

President, H. F. Osborn, American Museum of Natural History.

Vice presidents, Madison Grant, 111 Broadway; F. K. Sturgis, 30 Broad Street.

Secretary, Madison Grant, 111 Broadway.

Treasurer, P. R. Pyne, 20 Exchange Place.

Director of the Zoological Park, W. T. Hornaday, One hundred and eighty-fifth Street and Southern Boulevard, Bronx.

Director of the Aquarium, C. H. Townsend, Battery Park.

Membership—Annual, 1,849; sustaining, 11; fellows, 14; corresponding, 9; honorary, 6; life, 320; patrons, 31; associate founders, 9; founders, 14; founders in perpetuity, 17; benefactors, 6; total, 2,286.

Dues—Annual, \$10; life, \$200; patrons, \$1,000; associate founders, \$2,500; founders, \$5,000; founders in perpetuity, \$10,000; benefactors, \$25,000.

Founded 1895. Annual meeting second Tuesday in January.

Publications—Zoological Society Bulletin (bimonthly), edited by E. R. Sanborn, \$1 a year; Zoologica (irregular), 25 cents a copy; Zoopathologica (irregular), 25 cents a copy; Tropical Wild Life in British Guiana, by William Beebe and others, \$3; A Monograph of the Pheasants, by William Beebe, 4 v., \$250; Our Vanishing Wild Life, by W. T. Hornaday, \$1.50; Popular Official Guide to the New York Zoological Park, by W. T. Hornaday, 40 cents; Guide to the New York Aquarium, by C. H. Townsend, 40 cents; Annual report.

The library contains about 3,500 volumes of zoological travel, exploration, and natural history, and is located in the Administration Building at the Zoological Park, One Hundred and Eighty-fifth Street and Southern Boulevard.

The society administers the New York Zoological Park and the New York Aquarium, and it maintains a tropical zoological station in British Guiana. It is working for the establishment of game sanctuaries, the protection of rivers and streams from pollution, and for the preservation of all forms of wild life.

Palisades Interstate Park Commission, New York Commission, 90 Wall Street, New York City.

President, ———.

Vice president, F. W. Hopkins, Alpine, N. J.

Secretary, J. D. White, 61 Broadway.

Treasurer, E. L. Partridge, 90 Wall Street.

General manager, W. A. Welsh, 88 Main Street, Haverstraw, N. Y.

Superintendent camp department, E. F. Brown, 90 Wall Street.

Organized 1900. Regular staff, 600.

Publications—Annual report; The Palisades Interstate Park Bulletin No. 10, New York State College of Forestry, Syracuse, N. Y.

The park is administered as a public recreation park by commissioners appointed by the governors of New York and New Jersey. It is supported by State and private funds and no commercial concessions are allowed. There are 200 miles of trails; and restaurants, rest pavilions, picnic groves, free rowboats, bathing, and canoe benches are provided. Seventy-two camps annually housing over 50,000 are maintained by social organizations.

Prairie Club, Chicago, Ill.

President, J. R. Bentley, 258 West Marquette Road.

Vice presidents, H. A. Barnett, 3400 North California Avenue; Miss C. A. Mitchell, Riverside, Ill.

Secretary-treasurer, J. E. Bayrd, 812 Tacoma Building, Chicago.

Membership—Active, 750; honorary, 6; total, 756.

Entrance fee and dues—Active, \$6.

Annual dues—Active, \$3.

Organized, 1908. Annual meeting first Thursday in December.

Publications—Bulletin (monthly); Yearbook.

Beach House, on the lake shore of the dune country in northern Indiana, reached by Illinois Central Railroad to Pullman, and Chicago, Lake Shore & South Bend Electric to Tremont.

Forest preserve camp via Palatine, Lake Zurich & Wauconda Railroad to Palatine.

Outings—Saturdays, week ends, and frequent excursions.

1920 camp, July 30 to August 21, at Batchawana Bay, Canada, on Lake Superior. Return fare from Chicago, \$44.

1920 outing, July 24 to August 15, Grand Trunk Railroad to Prince Rupert, steamer to Vancouver, and return by Canadian Pacific Railroad. Camps will be established at Jasper and Mount Robson Parks.

Expense from Chicago, about \$225.

Rocky Mountain Climbers' Club, Boulder, Colo.

President, C. C. Casey, Longmont.

Vice president, Ray Clarke, Boulder.

Secretary, F. A. Boggess, Boulder.

Recorder, F. E. Eckel, Boulder.

Treasurer, Ernest Greenman, Boulder.

Membership—Degree members, 200; life, 42; total, 242.

Annual dues, \$1; life, \$10.

Organized 1910. Annual meeting held in second week of August.

Clubroom in the Community House, Colorado Chautauqua grounds.

Outings—Week ends during July and August.

1920 outing, August 27 to 29, at Longs Peak, Rocky Mountain National Park. Expense from Boulder, \$17.50.

Sagebrush and Pine Club, Yakima, Wash.

President, J. H. Wright.

Vice president, Horace Dearle.

Secretary, Miss Marion Scholes.

Treasurer, Marvin Thornton.

Membership—Active, 40.

Annual dues, \$6.

Organized 1915. Annual meeting first Wednesday in January.

Lodge in the Cascade Mountains near Yakima.

Outings—Saturdays and Sundays.

1920 outing, July 11 to 18, across the Cascades to Mount Rainier. Expense from Yakima, \$25.

Save the Redwoods League, University of California, Berkeley, Calif.

President, F. K. Lane, 120 Broadway, New York.

Chairman executive committee, J. C. Merriam, University of California.

Secretary-treasurer, R. G. Sproul, 430 Library, University of California.

Membership—Annual, juvenile, patrons.

Annual dues, \$2; juvenile, 50 cents; patrons, \$500.

Organized 1918.

Publication.—Saving the Redwoods, by Madison Grant, New York Zoological Society, 111 Broadway, New York.

The league is working to secure the finest redwoods along the California State Highway in the hope that they may be included in a State park. It is also seeking to create a national redwood park.

Sierra Club, 402 Mills Building, San Francisco, Calif.

President, William Frederic Badè, 2616 College Avenue, Berkley, Calif.

Vice president, Clair S. Tappaan, Los Angeles, Calif.

Secretary, William E. Colby, 2901 Channing Way, Berkeley, Calif.

Treasurer, J. N. LeConte, 19 Hillside Court, Berkeley, Calif.

SOUTHERN CALIFORNIA SECTION, 315 WEST THIRD STREET, LOS ANGELES, CALIF.

Chairman, P. S. Bernays, 318 West Third Street.

Secretary, C. J. Fox, 1225 West Sixth Street.

Outings.—Saturdays, Sundays, and holidays.

Membership.—Active, 2,050; life, 44; honorary, 16; total, 2,110.

Entrance fee and dues, \$5; annual dues, \$3; life, \$50.

Organized 1892. Annual meeting, first Saturday in May.

Publication.—Sierra Club Bulletin (annually), edited by W. F. Badè, 75 cents.

Clubrooms and library, 402 Mills Building, San Francisco.

LeConte Memorial Lodge, Yosemite Valley; Parsons Memorial Lodge, Tuolumne Meadows, Yosemite National Park; Muir Lodge, Big Santa Anita Canyon, reached by electric from Los Angeles to Sierra Madre.

Outings.—Saturdays, Sundays, and holidays. Annual winter sports outing in January.

1920 outing, July 2 to July 31, South Fork of the San Joaquin and Middle Fork of the Kings. Expense from San Francisco or Los Angeles about \$100.

Trails Club of Oregon, Portland, Oreg.

President, R. J. Grace, 919 Chamber of Commerce Building.

Vice presidents, S. M. Fries, 307 United States Bank Building; H. W. Erren, 285 Ross Street.

Secretary, Miss M. L. Drew, Board of Trade Building.

Treasurer, A. Schaller, Oregon Building.

Membership.—Active, 78; honorary, 1; total, 79.

Annual dues.—Resident, \$3; nonresident, \$1.

Organized 1915. Annual meeting second week in January.

Club shelter cabin on Larch Mountain, 6½ miles from Multnomah Falls. Open to the public. The club constructs and maintains trails to points of scenic interest.

Outings.—Saturday, Sunday, and holiday trips.

Tramp and Trail Club, New York City.

President, Frank Place, jr., 17 West Forty-third Street.

Secretary-treasurer, A. B. Malcomson, jr., 2435 Morris Avenue.

Membership.—Active, 50; honorary, 5; total, 55.

Annual dues, \$1.50.

Organized 1914. Annual meeting middle of May.

Outings.—Sundays and holidays.

Travel Club of America, Room 1144, Grand Central Palace, New York City.

President, H. C. Walsh, Grand Central Palace.

Vice presidents, M. F. Egan, D. L. Brainard, Anthony Fiala, B. T. Hyde, F. L. Monsen.

Secretary, W. F. Wagner, Grand Central Palace.

Treasurer, J. T. Geery, Grand Central Palace.

Membership.—Active, 4,000; associate, 12,000; life, 32; total, 16,032.

Annual dues—Active, \$10; associate, \$5 (and \$5 initiation fee); life, \$100.

Organized 1912. Annual meeting, last Saturday in November.

Official organ—Travel (monthly), edited by Miss K. N. Birdsall, \$4 a year.

The club is working for the conservation of natural resources, the preservation of scenery, and the extension of national parks.

Utah Mountain Club, Salt Lake City, Utah.

President, G. W. Middleton, Deseret Bank Building.

Vice president, F. J. Pack, University of Utah.

Secretary-treasurer, J. E. Broadbush, 312 Walker Bank Building.

Membership—Active, 60.

Organized 1919. Annual dues, \$3.

Outings—Week-end walks and excursions.

Wild Flower Preservation Society of America, New York Botanical Garden, New York City.

President, Henry C. Cowles, University of Chicago.

Secretary-treasurer, Mrs. Elizabeth G. Britton, New York Botanical Garden.

Managers, C. F. Millspaugh, R. A. Harper, J. W. Harshberger, N. L. Britton, M. A. Howe, Jean Broadhurst, Norman Taylor, W. T. Davis, F. V. Coville.

Chapters—In Baltimore; Chicago; Fayette, Iowa; Milwaukee; Philadelphia; Riverside, Ill.; and Washington.

Membership—Junior, active, sustaining, fellows, patrons, and affiliated societies.

Annual dues—Active, 50 cents; sustaining and affiliated societies, \$1; fellow, \$25; patron, \$50.

Organized 1902. Annual meeting in the spring.

Official organ—Torreya (monthly), edited by Norman Taylor, \$1 a year.

The society is educating its members and the public to appreciate and protect plants and flowers for their natural beauty, and as food and shelter for birds and animals.

REPORT OF THE DIRECTOR ON APPLICATION OF FREMONT-MADISON RESERVOIR COMPANY FOR IRRIGATION EASEMENTS IN YELLOWSTONE NATIONAL PARK.

DEPARTMENT OF THE INTERIOR,
NATIONAL PARK SERVICE,
Washington, D. C., January 31, 1920.

DEAR MR. SECRETARY: The Commissioner of the General Land Office has forwarded to you through me the attached letter relating to the application of the Fremont-Madison Reservoir Co., for easements for two reservoir sites in the Falls River district of Yellowstone National Park. The Commissioner states that this application has been submitted to the Geological Survey and the Reclamation Service, and that the directors of these services have reported, respectively, that the allowance of this application will not affect any valuable power possibilities or interfere with any present or contemplated project of the Reclamation Service. The matter was also submitted to me by the Commissioner of the Land Office on December 17, requesting information as to my views on the application, and I replied that we had no facts available which would show the effect the construction of the reservoirs would have on Yellowstone National Park, and that I could not make a full report on the pending application until after field examinations were made by an officer of this bureau.

Previous to the filing of the application in the General Land Office, Messrs. W. G. Swendsen, commissioner of reclamation of the State of Idaho; P. S. A. Bickel, engineer for I. B. Perrine; and State Senator Fuller, of Ashton, Idaho, conferred with me regarding the proposed irrigation project, and I told them that it would be impossible for me to state the effect the construction of these reservoirs would have on Yellowstone Park until after an examination had been made on the ground; that I would make such an examination as early in the spring as it would be possible to do this, and that I preferred to make this examination personally. All of these men agreed, from the standpoint of the park, such an examination ought to be made, and two of them, Messrs. Swendsen and Fuller, offered to accompany me when I made my study of this project. It was

understood that the application should not be pressed at this time, but they had no sooner left my office when they began to demand favorable consideration of the project without reference to the National Park Service. Since that time they have consistently avoided this office and have given no further consideration to the relation of this bureau to their project.

I can not submit at this time anything but an adverse report on this project, and urge upon you as strongly as I can the necessity for taking no favorable action upon it. Should I take any other view, as I see it, I would be violating the obligations imposed upon me as director of the National Park Service, which is to so administer Yellowstone Park that it be preserved in its natural state unimpaired for future generations, and I can not say, because I do not have the facts available, whether the establishment of reservoirs in the Falls River Basin will or will not injure the park, in view of the fact that an immense body of land is involved. It is more than likely that very extensive and permanent injury will be done to the park, and, as I see it, we can not proceed too carefully in acting upon an application that may bring vast injury to a park that has been untouched by the hand of commercialism during a period of 50 years and which, if injured, would bring upon us untold adverse criticism.

As I see it, it does not make any difference what any other bureau of the Interior Department has to say about the pending application. The primary question is, Will the reservoirs injure Yellowstone Park? This can only be determined by the National Park Service. I will personally make an examination of the lands involved as soon as I can in the spring, and until that time no further action should be taken.

Aside from the considerations mentioned above I contend that the following points should be given your careful personal attention:

1. Under the law the Secretary of the Interior has no authority to grant easements for reservoir sites in Yellowstone National Park. The word "reservations" in the act of March 3, 1891 (26 Stat., 1095), was never intended to cover Yellowstone Park. I say this with due respect to the attitude of former Secretary Hoke Smith in the Sequoia National Park irrigation case of March 21, 1895 (20 L. D., 253). Subsequent acts of Congress clearly indicate the Secretary's view is wrong and that Congress did not intend in the act of March 3, 1891, to make the word "reservations" cover national parks. In this connection I refer you to a memorandum of Mr. E. C. Finney, a member of the Board of Appeals, dated June 26, 1917, expressing his views on the problem and question, and it should be noted that in this opinion Mr. W. B. Newman, also of the Board of Appeals, concurred. I quote the opinion in full:

There has been referred to me for consideration the attached papers involving the application for an easement for irrigation within the boundaries of the Yellowstone National Park. Mr. Mahaffie has expressed the opinion that the act of March 3, 1891 (26 Stat., 1095), authorizes the granting of such an easement by the Secretary of the Interior. It appears that the department held to this effect in a case in the Sequoia National Park, Calif.

I can not see my way clear to agree with this view of the law. The act of March 3, 1891, *supra*, grants a right of way for irrigation ditches and canals "through public lands and reservations of the United States," with a proviso that no such right of way shall be located so as to interfere with the proper occupation by the Government of any such reservation. I do not believe that the word "reservation" as used in the act had any reference whatever to national parks. National parks are all created by special acts of Congress, and one of the objects stated in each of those acts is that the lands and curiosities within the parks shall be preserved in their natural condition. The acts, including the one applicable to the Yellowstone, do not authorize the Secretary of the Interior to grant any patents or permanent easements or indeterminate leases of any kind in the parks. They do provide for limited-term leases for hotels and other accommodations for the people visiting same. Railroads can not secure rights of way through national parks without congressional consent.

The act of February 15, 1901, authorizing the issuance of revocable permits for all sorts of reservoirs, dams, canals, and pipe lines for the transportation of water or the generation and transmission of power, uses the term "public lands and reservations," as does the act of March 3, 1891, *supra*. Nevertheless, we have always held that permits under the act of 1901 could not be granted in national parks without express congressional permission, and in the act of February 15, 1901, Congress expressly provided that the act should be applicable to "public lands, forest and other reservations of the United States, and the Yosemite, Sequoia, and General Grant National Parks, California." This language clearly shows that Congress, when passing the latter act, did not regard the parks as reservations, because it used the term "reservations of the United States," and immediately followed it with authority to grant revocable permits in three national parks named. The whole spirit of the laws relating to national parks is antagonistic to the idea that permanent easements should be granted therein.

Considering all of the laws mentioned, I reach the conclusion that you are without authority to grant such an easement within the Yellowstone National Park. I may add that Mr. Newman, who has given the matter some thought, agrees with this view.

It should be pointed out also that in the following acts of Congress specific provision is made for the use of park lands by the Reclamation Service, thus

indicating that it was not the intention of Congress to make the act of March 3, 1891, cover national parks:

Act of May 11, 1910 (36 Stat., 354), creating Glacier National Park, containing the following proviso:

* * * that the United States Reclamation Service may enter upon and utilize for fowage or other purposes any area within said park which may be necessary for the development and maintenance of a Government reclamation project.

Identical provisions will be found in the following acts:

Act of January 6, 1915 (38 Stat., 798), creating Rocky Mountain National Park.

Act of August 9, 1916 (39 Stat., 442), creating Lassen Volcanic National Park.

In the act of February 26, 1919 (40 Stat., 1175), creating the Grand Canyon National Park, the following provision will be found:

That whenever consistent with the primary purposes of said park, the Secretary of the Interior is authorized to permit the utilization of areas therein which may be necessary for the development and maintenance of a Government reclamation project.

2. There is a grave question of policy involved in the consideration of this application. If the Falls River Basin application is acted upon favorably it will constitute a precedent for raising lakes of the park with consequent destruction of timber and impairment of some of the greatest scenic attractions of the park. That Yellowstone Park is better known even than the Yosemite can easily be conceived, and the opening of the door for the ruination of its beautiful lakes will create a situation that will be worse than the Hetch Hetchy, so far as the people of the United States at large would be inclined to view it.

3. Other reservoir sites in the neighborhood of Yellowstone Park should be considered before this application is acted upon finally. Why not use Henrys Lake, which is at the head of the North Fork of the Snake? Has it been demonstrated that there are no reservoir sites besides Falls River below the park? We would certainly not be justified in allowing the use of park lands when there are other sites available.

4. It may be that the use of other reservoir sites would involve the purchase of private holdings. I know this to be the case should Henrys Lake be used as a reservoir site. Are we justified in allowing the use of national park lands just because they belong to the Government and could be developed with less expense? The Falls River Basin is not in private hands because of the park. Had it not been for the park they would have been taken up many years ago, and would not now be available for reservoir sites.

5. The Falls River Basin is an important section of the Yellowstone wilderness from the standpoint of big game. It is the favorite haunt of the moose, and there is a large elk herd in this region. It is idle to say that the construction of these reservoirs would not drive these animals out. The construction of the dams involved would undoubtedly be responsible for the partial if not complete elimination of these moose and elk herds. The moose particularly will not stand civilization. However, this is a point that should be considered in my personal investigation. The rangers of Yellowstone Park report that the construction of the dams would drive away the game because it would ruin their feeding grounds. The country is ideal moose country, being swampy and otherwise adapted to their habits of living.

6. Back in 1878 Henry Gannett, of the Geological Survey, went through this country with a topographical survey party, and he makes the following comment on the region in his report:

This stream, named from its discoverer, Mr. G. B. Bechler, at that time topographer of one of the parties of this survey, heads opposite the head of the Madison or Firehole River and Shoshone Lake, being separated from them by narrow, abrupt divides of no great height. Its head and most of its course are through a high volcanic plateau, and for most of its course it is sunken far below the general level in a deep, rugged canyon. The plateau is well timbered with the larger conifers. Falls River Basin, into which this stream debouches abruptly, the plateau ending suddenly in a line of cliffs facing to the westward, is a large valley, part of which is open, while a part is covered with a dense growth of large conifers, and the ground is lumbered with fallen timber to such an extent that, added to the swampy, springy nature of the soil, the basin is well-nigh impassable. Of the extent of the basin I can not speak, as it extends far to the west and north of the limits of my work. Into it flow several large streams. Besides Bechlers Fork, Falls River, Cascade Creek, and a large northern branch of Falls River enter this basin. * * * *It is one of the few remaining haunts of the moose in the Northwest.*

(The Italics are mine.) If this region was one of the few remaining haunts of the moose in 1878, it must be much more important as a moose haunt at the present time.

Concerning the Falls River reservoir site, I quote the following from Mr. Gannett's report relating to Falls River:

This stream heads in the southern slopes of the great plateau which Bechlers Fork traverses, rising in four large springs, which give birth immediately to a good-size river. Its course is nearly due west, skirting the southern base of this plateau. The divide between this stream and the Snake is very gentle, being, indeed, almost imperceptible. Its course from the divides to the Lakes Beaulah and Hering is very quiet, with a gentle current through grassy meadows, but from the point of its emergence from the former of these lakes, it becomes a brawling, turbulent stream, broken by cataracts and falls, from which it has received its name. These falls, which succeed one another at short intervals, have heights, respectively, of 12, 6, 12, 40, 20, and 30 feet. Finally, at a point but 3 or 4 miles above where the stream debouches into Falls River Basin, occur the Great Falls. These, which are close together, consist of two, each having a clear leap of over 20 feet, closely followed by a third of 47 feet, below which are two smaller ones. The total descent is 140 feet, my measurements agreeing very closely with those of Prof. Bradley.

It is clear that this part of the park may have some important recreation possibilities, and it is altogether likely that it should be preserved in its natural state. In any event, if it is to be given to private interests, it should be given by act of Congress, upon recommendation of this department, after the National Park Service has had an opportunity to examine it thoroughly and determine exactly what adverse effect it will have upon Yellowstone National Park.

I contend that consideration of the pending application should be suspended at present, and if upon reconsideration of the legal question it is determined that the Secretary of the Interior has no right to act upon the application, it should be forthwith declared to be improperly before the Interior Department.

Cordially yours,

(Signed)

STEPHEN T. MATHER,
Director.

The honorable The SECRETARY OF THE INTERIOR.

CONSERVATION OF INLAND LAKES AND MARSHES AS A VALUABLE PUBLIC ASSET.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF BIOLOGICAL SURVEY,
Washington, D. C., May 19, 1920.

During the last annual meeting of the International Association of Fish and Game Commissioners, as well as at the game-conservation meeting recently held under the auspices of the American Game Protective Association, in New York City, great interest was manifested in the statements showing the urgent need of conserving water areas in order to maintain our supply of migratory game birds, and thus perpetuate wild-fowl hunting in the United States.

Reports received during the last few months by the Biological Survey from all parts of the country agree that the alarming decrease of migratory wild fowl which preceded the treaty and the act of Congress for the protection of migratory birds has changed to a marked increase. This successful outcome of a great conservation measure has become apparent even more promptly than was anticipated by its friends. Thus the first important step toward insuring the perpetuation of our wild fowl and of wild-fowl hunting has been achieved. Another step of almost equally vital importance, if we are to hold what we have gained, remains to be taken. This consists of the conservation and perpetuation of a sufficient number of small inland lakes, as well as inland and coastal swamp and marsh areas, to provide our migratory wild fowl places for feeding and resting and rearing their young.

It is absolutely necessary that during their migrations and in winter these birds have the necessary places in which to live. There is no question that for a long period in the future vast areas of swamp lands in Alaska and northern Canada will furnish abundant breeding places for innumerable wild fowl. Regarding the maintenance of available winter haunts of these birds, there is at the present time a distinct uncertainty, and the situation is rapidly becoming more and more adverse.

The mistaken idea is prevalent that the drainage of almost any area is a benefit to the community. Under proper conditions "water farming" of many lakes and ponds and of swamp or marsh areas will yield a distinctly larger return than would the same area drained and used for agriculture. Under intelligent management these areas will yield abundant and varied returns to the community, as indicated in the following brief summary of their productiveness:

(1) Food and game fishes.

- (2) Wild fowl to be shot for sport and food.
- (3) Furs from such fur bearers as the muskrats, skunks, and raccoons, which frequent their borders.
- (4) A natural ice supply.
- (5) A definite and invaluable help in maintaining the underground water level in various parts of the State, and in helping hold back the run-off of rainfall to prevent excessive erosion and other damage.
- (6) Opportunities for healthful and interesting recreation for the citizens of the State.
- (7) Where such water areas are included in State parks or reservations, they lend themselves admirably to educational uses, and help interest the people of the State in out-of-door life and in the natural resources of the State in the form of plant and animal life, which are such important elements in supplying useful commodities.

I believe that a careful survey of the water and marsh areas in any State by men properly versed in the plant and animal products, as well as of the agricultural capacities of the areas in question, will result in the great majority of cases in definitely determining the superior value to the State of such water areas in their natural conditions as against the value of the lands which would be left after they had been drained. Furthermore, the existence of these areas in the State adds greatly to the varied character of the region where located and thus renders them more generally attractive as places of residence for the citizens.

The Biological Survey is deeply interested in the proper conservation of water areas, since the rapidly increasing drainage of lakes and marshes throughout the country indicates that, unless an effort is made to conserve a considerable number of the best of these for the future, our wild-fowl resorts and feeding places will be practically eliminated from most of the States, and with the elimination of such areas there will disappear opportunities for wild-fowl hunting, and there will be a loss of other products and benefits provided by such water areas.

In connection with the administration of the migratory-bird treaty act, the Biological Survey is advocating the establishment throughout the country of Federal and State bird preserves. This is to be accomplished through cooperation with the State fish and game commissions. Throughout the country such water areas should be strictly guarded as breeding preserves, thereby resulting in largely augmenting the available supply of birds. A certain proportion of such areas should be maintained throughout the year as sanctuaries where no shooting should be permitted, but the majority of them should be made public shooting grounds during the open season. This would in no way interfere with the use of these areas as nesting places for wild fowl during the breeding season. By these means the public would have the same opportunities of shooting migratory wild fowl as are now enjoyed by the owners of private preserves, thus equalizing conditions.

It is extremely gratifying to know that in some of the more progressive States efforts are being made to save water areas from further unreasonable destruction. The Conservation Commission of Iowa is already working out plans to this effect under a State law which will permit the saving of the desirable water areas from ill-considered drainage. Under the law of Minnesota recent decisions of the State courts have safeguarded water areas from drainage on the ground of their value to the public in their natural state. Some other States are working along similar lines, but no general policy has yet been agreed upon.

The results of recent investigations show that wild fowl fly across country in all directions from their main congregating places, thus showing that hunters should take a keen interest in the proposed conservation of water areas in all other States as well as in their own. Once a general policy is established for the maintenance of water areas suitable for wild-fowl resorts, sportsmen may feel assured that a goodly amount of wild-fowl hunting will be possible for a long period in the future. Such a result, however, will not come without earnest effort on the part of sportsmen working with State fish and game commissioners. The Biological Survey desires to make itself useful in helping bring about this next great conservation project for the maintenance of our wild fowl and of vigorous and health-giving out-of-door sports.

E. W. NELSON,
Chief, Bureau of Biological Survey.

STATEMENT OF NATIONAL PARK POLICY.

DEPARTMENT OF THE INTERIOR.

Washington, May 13, 1918.

DEAR MR. MATHER: The National Park Service has been established as a bureau of this department just one year. During this period our efforts have been chiefly directed toward the building of an effective organization while engaged in the performance of duties relating to the administration, protection, and improvement of the national parks and monuments, as required by law. This constructive work is now completed. The new Service is fully organized; its personnel has been carefully chosen; it has been conveniently and comfortably situated in the new Interior Department Building; and it has been splendidly equipped for the quick and effective transaction of its business.

For the information of the public an outline of the administrative policy to which the new Service will adhere may now be announced. This policy is based on three broad principles: First, that the national parks must be maintained in absolutely unimpaired form for the use of future generations as well as those of our own time; second, that they are set apart for the use, observation, health, and pleasure of the people; and third, that the national interest must dictate all decisions affecting public or private enterprise in the parks.

Every activity of the Service is subordinate to the duties imposed upon it to faithfully preserve the parks for posterity in essentially their natural state. The commercial use of these reservations, except as specially authorized by law, or such as may be incidental to the accommodation and entertainment of visitors, will not be permitted under any circumstances.

In all of the national parks except Yellowstone you may permit the grazing of cattle in isolated regions not frequented by visitors, and where no injury to the natural features of the parks may result from such use. The grazing of sheep, however, must not be permitted in any national park.

In leasing lands for the operation of hotels, camps, transportation facilities, or other public service under strict Government control, concessioners should be confined to tracts no larger than absolutely necessary for the purposes of their business enterprises.

You should not permit the leasing of park lands for summer homes. It is conceivable, and even exceedingly probable, that within a few years under a policy of permitting the establishment of summer homes in national parks, these reservations might become so generally settled as to exclude the public from convenient access to their streams, lakes, and other natural features, and thus destroy the very basis upon which this national playground system is being constructed.

You should not permit the cutting of trees except where timber is needed in the construction of buildings or other improvements within the park and can be removed without injury to the forests or disfigurement of the landscape, where the thinning of forests or cutting of vistas will improve the scenic features of the parks, or where their destruction is necessary to eliminate insect infestations or diseases common to forests and shrubs.

In the construction of roads, trails, buildings, and other improvements particular attention must be devoted always to the harmonizing of these improvements with the landscape. This is a most important item in our program of development and requires the employment of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the esthetic value of park lands. All improvements will be carried out in accordance with a preconceived plan developed with special reference to the preservation of the landscape, and comprehensive plans for future development of the national parks on an adequate scale will be prepared as funds are available for this purpose.

Wherever the Federal Government has exclusive jurisdiction over national parks it is clear that more effective measures for the protection of the parks can be taken. The Federal Government has exclusive jurisdiction over the national parks in the States of Arkansas, Oklahoma, Wyoming, Montana, Washington, and Oregon, and also in the Territories of Hawaii and Alaska. We should urge the cession of exclusive jurisdiction over the parks in the other States, and particularly in California and Colorado.

There are many private holdings in the national parks, and many of these seriously hamper the administration of these reservations. All of them should be eliminated as far as it is practicable to accomplish this purpose in the course of time, either through congressional appropriation or by acceptance of donations of these lands. Isolated tracts in important scenic areas should be given first consideration, of course, in the purchase of private property.

Every opportunity should be afforded the public, wherever possible, to enjoy the national parks in the manner that best satisfies the individual taste. Automobiles and motorcycles will be permitted in all of the national parks; in fact, the parks will be kept accessible by any means practicable.

All outdoor sports which may be maintained consistently with the observation of the safeguards thrown around the national parks by law will be heartily indorsed and aided wherever possible. Mountain climbing, horseback riding, walking, motoring, swimming, boating, and fishing will ever be the favorite sports. Winter sports will be developed in the parks that are accessible throughout the year. Hunting will not be permitted in any national park.

The educational, as well as the recreational, use of the national parks should be encouraged in every practicable way. University and high-school classes in science will find special facilities for their vacation-period studies. Museums containing specimens of wild flowers, shrubs, and trees, and mounted animals, birds, and fish native to the parks, and other exhibits of this character will be established as authorized.

Low-priced camps operated by concessioners should be maintained, as well as comfortable and even luxurious hotels wherever the volume of travel warrants the establishment of these classes of accommodations. In each reservation, as funds are available, a system of free camp sites will be cleared, and these grounds will be equipped with adequate water and sanitation facilities.

As concessions in the national parks represent in most instances a large investment, and as the obligation to render service satisfactory to the department at carefully regulated rates is imposed, these enterprises must be given a large measure of protection, and, generally speaking, competitive business should not be authorized where a concession is meeting our requirements, which, of course, will as nearly as possible coincide with the needs of the traveling public.

All concessions should yield revenue to the Federal Government, but the development of the revenues of the parks should not impose a burden upon the visitor.

Automobile fees in the parks should be reduced as the volume of motor travel increases.

For assistance in the solution of administrative problems in the parks relating both to their protection and use the scientific bureaus of the Government offer facilities of the highest worth and authority. In the protection of the public health, for instance, the destruction of insect pests in the forests, the care of wild animals, and the propagation and distribution of fish, you should utilize their hearty cooperation to the utmost.

You should utilize to the fullest extent the opportunity afforded by the Railroad Administration in appointing a committee of western railroads to inform the traveling public how to comfortably reach the national parks; you should diligently extend and use the splendid cooperation developed during the last three years among chambers of commerce, tourist bureaus, and automobile highway associations for the purpose of spreading information about our national parks and facilitating their use and enjoyment; you should keep informed of park movements and park progress, municipal, county, and State, both at home and abroad, for the purpose of adapting, whenever practicable, the world's best thought to the needs of the national parks. You should encourage all movements looking to outdoor living. In particular, you should maintain close working relationship with the Dominion parks branch of the Canadian department of the interior and assist in the solution of park problems of an international character.

The department is often requested for reports on pending legislation proposing the establishment of new national parks or the addition of lands to existing parks. Complete data on such park projects should be obtained by the National Park Service and submitted to the department in tentative form of report to Congress.

In studying new park projects you should seek to find scenery of supreme and distinctive quality or some natural feature so extraordinary or unique as to be of national interest and importance. You should seek distinguished examples of typical forms of world architecture, such, for instance, as the Grand Canyon, as exemplifying the highest accomplishment of stream erosion, and the high, rugged portion of Mount Desert Island as exemplifying the oldest rock forms in America and the luxuriance of deciduous forests.

The national park system as now constituted should not be lowered in standard, dignity, and prestige by the inclusion of areas which express in less than the highest terms the particular class or kind of exhibit which they represent.

It is not necessary that a national park should have a large area. The element of size is of no importance as long as the park is susceptible of effective administration and control.

You should study existing national parks with the idea of improving them by the addition of adjacent areas which will complete their scenic purposes or facilitate administration. The addition of the Teton Mountains to the Yellowstone National Park, for instance, will supply Yellowstone's greatest need, which is an uplift of glacier-bearing peaks; and the addition to the Sequoia National Park of the Sierra summits and slopes to the north and east, as contemplated by pending legislation, will create a reservation unique in the world, because of its combination of gigantic trees, extraordinary canyons, and mountain masses.

In considering projects involving the establishment of new national parks or the extension of existing park areas by delimitation of national forests, you should observe what effect such delimitation would have on the administration of adjacent forest lands, and, wherever practicable, you should engage in an investigation of such park projects jointly with officers of the Forest Service, in order that questions of national park and national forest policy as they affect the lands involved may be thoroughly understood.

Cordially, yours,

FRANKLIN K. LANE,
Secretary.

MR. STEPHEN T. MATHER,
Director, National Park Service.

AN ACT TO ESTABLISH A NATIONAL PARK SERVICE, AND FOR OTHER PURPOSES.

(39 Stat., 535.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby created in the Department of the Interior a service to be called the National Park Service, which shall be under the charge of a director, who shall be appointed by the Secretary and who shall receive a salary of \$4,500 per annum. There shall also be appointed by the Secretary the following assistants and other employees at the salaries designated: One assistant director, at \$2,500 per annum; one chief clerk, at \$2,000 per annum; one draftsman, at \$1,800 per annum; one messenger, at \$600 per annum; and, in addition thereto, such other employees as the Secretary of the Interior shall deem necessary: *Provided*, That not more than \$8,100 annually shall be expended for salaries of experts, assistants, and employees within the District of Columbia not herein specifically enumerated unless previously authorized by law. The service thus established shall promote and regulate the use of the Federal areas known as national parks, monuments, and reservations hereinafter specified by such means and measures as conform to the fundamental purpose of the said parks, monuments, and reservations, which purpose is to conserve the scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations.

SEC. 2 That the director shall, under the direction of the Secretary of the Interior, have the supervision, management, and control of the several national parks and national monuments which are now under the jurisdiction of the Department of the Interior, and of the Hot Springs Reservation in the State of Arkansas, and of such other national parks and reservations of like character as may be hereafter created by Congress: *Provided*, That in the supervision, management, and control of national monuments contiguous to national forests the Secretary of Agriculture may cooperate with said National Park Service to such extent as may be requested by the Secretary of the Interior.

SEC. 3. That the Secretary of the Interior shall make and publish such rules and regulations as he may deem necessary or proper for the use and management of the parks, monuments, and reservations under the jurisdiction of the National Park Service, and any violations of any of the rules and regulations authorized by this Act shall be punished as provided for in section fifty of the Act entitled "An Act to codify and amend the penal laws of the United States," approved March fourth, nineteen hundred and nine, as amended by section six of the Act of June twenty-fifth, nineteen hundred and ten (Thirty-sixth United States Statutes at Large, page eight hundred and fifty-seven). He may also, upon terms and conditions to be fixed by him, sell or dispose of timber in those cases where in his judgment the cutting of such timber is required in order to control the attacks of insects or diseases or otherwise conserve the scenery or the natural or historic objects in any such park, monument, or reservation. He may also provide in his discretion for the destruction of such animals and of such plant life as may be detrimental to the use of any of said parks, monuments, or reservations. He may also grant privileges, leases, and permits for the use of land for the accommodation of visitors in the various parks, monuments, or other reservations herein provided for, but for periods not exceeding twenty years; and no natural curiosities, wonders, or objects of interest shall be leased, rented, or granted to anyone on such terms as to interfere with free access to them by the public: *Provided, however*, That the Secretary of the Interior may, under such rules and regulations and on such terms as he may prescribe, grant the privilege to graze live stock within any national park, monument, or reservation herein referred to when in his judgment such use is not detrimental to the primary purpose for which such park, monument, or reservation was created, except that this provision shall not apply to the Yellowstone National Park.

SEC. 4. That nothing in this Act contained shall affect or modify the provisions of the Act approved February fifteenth, nineteen hundred and one, entitled "An Act relating to rights of way through certain parks, reservations, and other public lands."

Approved, August 25, 1916.

AN ACT FOR THE PRESERVATION OF AMERICAN ANTIQUITIES.

(34 Stat., 225.)

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person who shall appropriate, excavate, injure, or destroy any historic or prehistoric ruin or monument, or any object of antiquity, situated on lands owned or controlled by the Government of the United States, without the permission of the Secretary of the department of the Government having jurisdiction over the lands on which said antiquities are situated, shall upon conviction, be fined in a sum of not more than \$500 or be imprisoned for a period of not more than ninety days, or shall suffer both fine and imprisonment, in the discretion of the court.

SEC. 2. That the President of the United States is hereby authorized, in his discretion, to declare by public proclamation historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest that are situated upon the lands owned or controlled by the Government of the United States to be national monuments, and may reserve as a part thereof parcels of land, the limits of which in all cases shall be confined to the smallest area compatible with the proper care and management of the objects to be protected: *Provided*, That when such objects are situated upon a tract covered by a bona fide unperfected claim or held in private ownership, the tracts, or so much

thereof as may be necessary for the proper care and management of the object, may be relinquished to the Government, and the Secretary of the Interior is hereby authorized to accept the relinquishment of such tracts in behalf of the Government of the United States.

SEC. 3. That permits for the examination of ruins, the excavation of archaeological sites, and the gathering of objects of antiquity upon the lands under their respective jurisdictions may be granted by the Secretaries of the Interior, Agriculture, and War to institutions which they may deem properly qualified to conduct such examination, excavation, or gathering, subject to such rules and regulations as they may prescribe: *Provided*, That the examinations, excavations, and gatherings are undertaken for the benefit of reputable museums, universities, colleges, or other recognized scientific or educational institutions, with a view to increasing the knowledge of such objects, and that the gatherings shall be made for permanent preservation in public museums.

SEC. 4. That the Secretaries of the departments aforesaid shall make and publish from time to time uniform rules and regulations for the purpose of carrying out the provisions of this act.

Approved, June 8, 1906.





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